

THE PECAN AND ITS CULTURE

H. HAROLD HUME

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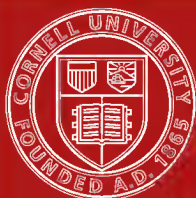
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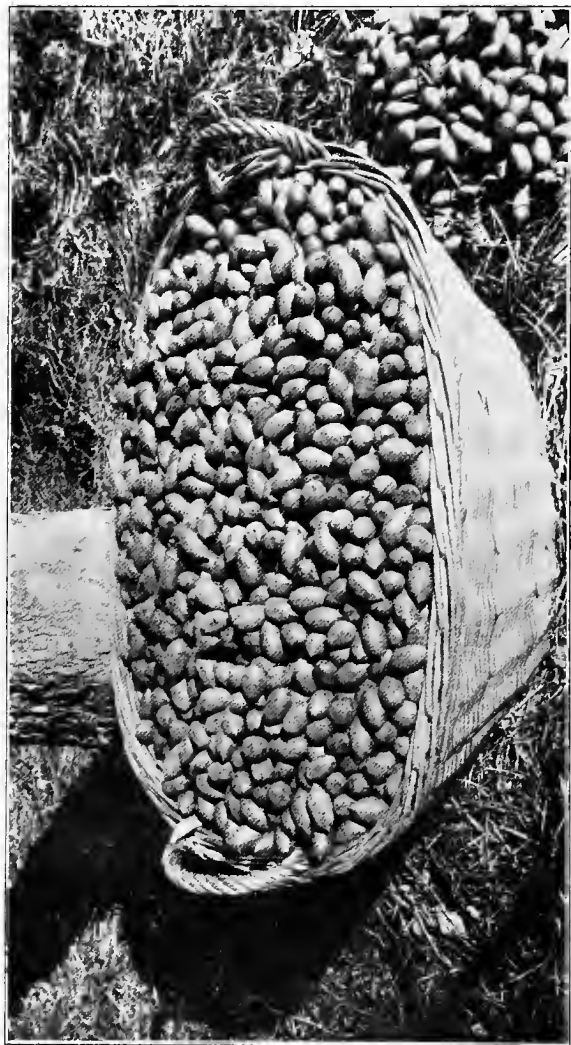


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THE PECAN AND ITS CULTURE



Pecan nuts—uniform in size, color and shape. Variety, Curtis.

THE PECAN AND ITS CULTURE

BY

H. HAROLD HUME

THIRD EDITION

PUBLISHED BY THE AUTHOR

1912

L.L.

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Second edition.

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Third edition, August, 1912

Mount Pleasant Press
J. Horace McFarland Company
Harrisburg, Pennsylvania

PREFACE TO THE FIRST EDITION

IN the horticultural development of the country, new fruits, new groups of fruits, new fruit industries are coming into prominence. Our native fruits in particular are now receiving, in many parts of the country, a larger share of the attention which they have always merited, and none has proven itself more worthy of careful study and painstaking care than the pecan.

Within the last ten or fifteen years, it has rapidly emerged from a wild or semi-wild condition to the status of an orchard nut. The foundations of its culture were laid a considerable time ago, but only now is it coming to its own,—its well-merited standing among the fruits of the country.

In any horticultural industry, many questions must be asked of the plant, the soil, the climate,—in short, of the plant in its environment. They must be answered aright, if the industry is to succeed. The newer the plant in cultivation, the more numerous the questions are, the more difficult to answer.

In an endeavor to aid in solving some of the problems connected with the culture of the pecan, this small volume has been prepared. Pecan culture has been the subject of careful study, observation and experimentation on the part of the author for a number of years, and the results of these studies are presented in the following pages.

To the many who have so kindly and willingly assisted in its preparation, my thanks are herein expressed.

H. HAROLD HUME.

RALEIGH, N. C.,
August 1, 1906.

PREFACE TO THE SECOND EDITION

SINCE the first edition was published in 1906, a great deal of new information has been secured on the culture of pecans. Our knowledge concerning the behavior of varieties in different regions has become more definite, the range of possible pecan culture has been more clearly defined, and a more intimate knowledge of its general requirements has been secured. Meanwhile, its consumption and the number of uses to which the pecan nut is put have increased manyfold. The status of the pecan in relation to the horticulture of a very large portion of the country has greatly increased in importance, though it has been plainly shown, at the same time, that its culture requires as much careful attention as does any other fruit. We can now look forward to the development of the pecan industry along stable and definite lines.

It is hoped that this new edition may assist greatly in the successful culture of this valuable nut, and that it may prove of practical value to the planter. It has been largely re-written, and a number of new illustrations have been added. For some of these new illustrations, I am indebted to Prof. P. H. Rolfs, Director Florida Experiment Station, Gainesville, Fla., and to Mr. Wm. N. Roper, of the American Fruit and Nut Journal, Petersburg, Va., and my thanks are hereby expressed.

H. HAROLD HUME,

GLEN SAINT MARY, FLA.
June 13, 1910.

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THE PECAN AND ITS CULTURE

CHAPTER I

IMPORTANCE OF THE PECAN

IN all-round excellence, the pecan is equaled by none of the native American nut-bearing trees, and certainly it is surpassed by no exotic species. It stands in the list of nut trees with but few equals and no superiors. With this fact known and admitted by all, it is reasonable to believe that the pecan will become a valuable addition to our list of cultivated fruits. Because of its intrinsic worth, it deserves a large share of attention, more than it has received. At present, it is gaining a position of so much importance as an orchard tree that, ere long, it will become an extremely important item in the horticultural wealth of the southern and southwestern states.

Large quantities of pecans are sold in our markets. These are the product of uncultivated or forest trees. Many orchards of considerable size, planted with meritorious budded and grafted varieties, are now in bearing, but the product of these plantings is used entirely by what may be termed a private trade,—either by seedsmen, or by private individuals for dessert purposes. Some day, varieties of pecans will become known in the markets, just as varieties of grapes, apples or pears are known. People ask for Niagara or Concord grapes, Northern Spy or Greening apples, Bartlett or Seckel pears—ask for what they want, and know what they are getting. The day is far distant when Frotscher,

Schley, Van Deman, Stuart, Curtis, or other varieties of pecans, will be known by name by the purchasing public, asked for in the markets, and recognized when procured. But that time must and will come, and until then there is no danger of the industry being overdone, —and not even then, because our population is constantly growing, because the pecan nut is being put to a variety of new uses, and as yet the export trade is entirely undeveloped. It would appear also that the pecan might reasonably be expected to replace, to a certain extent, the foreign nuts in our own markets.

According to the investigations of Woods and Merrill,* the pecan has a higher food value than either the walnut, filbert, cocoanut, almond or peanut. The results of their analyses are as follows:

	Edible Portion	Edible Portion					Fuel Value Per Pound†
		Water	Protein	Fat	Carbo- hydrates	Ash	
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Calories
Pecans, kernels	100.0	2.9	10.3	70.8	14.3	1.7	3445
Walnuts, kernels	100.0	2.8	16.7	64.4	14.8	1.3	3305
Filberts, kernels	100.0	3.7	15.7	65.3	13.0	2.4	3290
Cocoanuts, shredded	100.0	3.5	6.3	57.3	31.6	1.3	3125
Almonds, kernels	100.0	4.8	21.0	54.9	17.3	2.0	3030
Shelled Peanuts	100.0	1.6	30.5	49.2	16.2	2.5	2955

† Calculated from analysis.

It is a fact worthy of note that the average man requires 3,500 calories of energy each day, an amount which must be secured from food consumed. One pound of pecan kernels, according to the above analysis, would supply 3,445 calories, or only 55 calories less than the amount required per day. We are not, be it understood, pointing out this fact because we believe

* See Index of Literature.



An avenue shaded by pecan trees.

that the pecan alone would be a satisfactory food,—though it is wholesome, nourishing and palatable, and should be used in larger quantities than is usually the case,—but simply to emphasize its high food value.

According to the foregoing analyses, the pecan is richer in fat than any of the other nuts. Seventy per cent. of the kernels is fat. The pecan may at some time be in requisition as a source of oil,—an oil which would doubtless be useful for salad purposes,—but it is never likely to be converted into oil until the present prices of nuts are greatly reduced.

If we turn from the dietary value of the nut to the ornamental value of the tree, we cannot but be forcibly impressed with its value as a shade and ornamental tree. For these purposes, it may be planted far outside the area in which fruit may be reasonably expected. If given good soil and sufficient plant food, it grows quite rapidly, making a stately, vigorous, long-lived tree. In its native forests it is a giant tree, sometimes reaching a height of upward of two hundred feet, with a trunk diameter of six feet. Isolated specimens, grown in the open, come to maturity with wide-spreading branches, and the whole tree has an exceedingly graceful appearance. In the pecan area there is no deciduous shade tree, neither oak nor elm nor maple, and certainly not the catalpa, poplar, nor paulownia, which surpasses the pecan either in beauty or in length of life. There are reasons why a person would sometimes rather plant an evergreen tree,—a live oak, camphor or magnolia for instance—but why the pecan should not be given preference over every other tree which sheds its leaves in autumn is something which we cannot quite understand. Why should not our streets and roads, our avenues and boulevards be lined with stately pecans rather than with shorter-lived and (judged by every standard) far less handsome trees? To our profit and the country's advantage, we may well



Pecan tree twice struck by lightning.

follow the example of France, Germany, and other European countries, in the planting of nut trees for shade and ornament, as well as for revenue. The objections urged against this plan are not real, they exist only in the minds of a short-sighted and thoughtless people. Wherever it will succeed, no other shade tree is so worthy of attention as the pecan, and, in the fruiting area, beauty and healthful shade may be combined with utility.

While it must be conceded that the pecan is not comparable with some other fruits in yielding quick returns, yet, on the other hand, the fact must not be overlooked that it is a long-lived tree. It will, under proper conditions of soil, climate and treatment, continue to bear fruit longer than almost any other tree which we cultivate. It will supply nuts for the tables of generations yet unborn, and cast its grateful shade o'er the path of the wayfarer hundreds of years hence. It has a possible productive period of centuries.

The amount of abuse which a healthy pecan tree will withstand is phenomenal, and is certainly indicative of great endurance and vitality. Trees have been injured by fire, flood and high winds, and yet have survived. The accompanying illustration shows one which has been struck twice by lightning. The tree is still in healthy condition, except for the rotting of the trunk, and is bearing a good crop of nuts. A broad, flat top has been produced in its effort to repair the damage.

As an orchard tree, it is well worth planting. The ground in which the trees are planted may be cultivated in other crops for a number of years, thus reducing to a minimum the cost of maintaining the planting; and, when the trees have come into bearing, the same area in trees will yield manyfold more in net returns than the same area in cotton or corn at the usual market prices.

PRESENT PRODUCTION

Definite statistics on the present output of pecan nuts are hard to secure. Most of the crop, which finds its way into the open market, is produced by native trees in Texas, Louisiana and Mississippi. Of these three states, Texas produces by far the greatest number of pounds. Even there, the waste is great, and it is doubtful whether more than three-quarters of the crop is ever marketed. The census estimate in 1899 was 3,206,850 pounds, and of this amount Texas was credited with 1,810,670 pounds. It is probable that the census figures have been greatly exceeded. In fact the crop has been estimated in some seasons at as much, as 900 cars, or 18,000,000 pounds, for Texas alone, which would make the total Gulf States crop something over 20,000,000 pounds.

The present pecan orchards of improved varieties in different parts of the country total many thousands of trees. Extensive plantings have been made in Georgia, Florida, Alabama, Mississippi and Louisiana, and lesser areas in nearly all the other states mentioned in Chapter III. But there is no doubt that, even when the present plantings—or such of them as are cared for—come into bearing, the growers will be as far short of supplying the demand as they are now; much less able to take care of a large export trade, which can undoubtedly be developed.

NUT EXPORTS AND IMPORTS

The import trade in different nuts has grown to enormous proportions. In 1908, the amount paid for foreign-grown nuts was \$9,643,943.00. Of the nuts imported, walnuts and almonds are the most important, as they are comparable with the pecan in their uses. The amount of almonds brought into the United States

in 1908 was 26,738,834 pounds; and of walnuts, 28,887,110 pounds. These figures are important, indicating, as they do, the large amounts of nuts consumed (to say nothing of the home-grown product). Moreover, it is not improbable that a large portion of the domestic consumption in these nuts might be supplanted by the pecan. Besides, they show what might be done in the export trade. As the pecan is peculiarly an American product, there would be no competition in marketing it other than what would come from other species of nuts.

When pecans were shown at the Paris Exposition, they called forth very favorable comment; and the few which have been placed on the European markets have commanded three or four times the price paid for other nuts commonly sold in the same markets. However, it will be some time yet before we can take care of our own markets.

At this time, as shown in the accompanying table, our nut exports, consisting mostly of peanuts, are unimportant as compared with our imports, and give an idea of the great undeveloped market which may some day be supplied.

EXPORTS OF NUTS FROM UNITED STATES FOR YEARS
1900-1908 INCLUSIVE

	Value
1900	\$156,490
1901	218,743
1902	304,241
1903	299,558
1904 ..	330,366
1905	309,195
1906	416,886
1907	382,165
1908	373,024

Considered from whatever standpoint we may choose, the pecan is a valuable tree, whether cultivated for its nuts or planted for shade or ornamental effect.

IMPORTATIONS OF NUTS INTO THE UNITED STATES FOR THE YEARS 1899-1908 INCLUSIVE, ACCORDING TO THE
MOST AUTHORITATIVE STATISTICS.*

Variety of Nuts	1899		1900		1901		1902		1903	
	Quantity Pounds	Value	Quantity Pounds	Value	Quantity Pounds	Value	Quantity Pounds	Value	Quantity Pounds	Value
Almonds.....	9,957,427	\$1,222,587	6,317,633	\$949,083	5,140,232	\$946,138	9,868,982	\$1,240,886	8,142,164	\$1,337,717
Cocoanuts.....	.....	625,789	.....	702,947	.....	804,233	.....	832,383	.....	908,242
Walnuts.....	(a)	(a)	(a)	(a)	(a)	(a)	(a)	(a)	12,362,567	1,106,033
Other.....	.....	879,166	.....	1,326,804	.....	1,518,484	.....	1,971,072	.....	1,514,406
Total nuts.....	.....	\$2,727,542	.....	\$2,978,834	.....	\$3,268,855	.....	\$4,044,341	.....	\$4,866,398

Variety of Nuts	1904		1905		1906		1907		1908	
	Quantity Pounds	Value	Quantity Pounds	Value	Quantity Pounds	Value	Quantity Pounds	Value	Quantity Pounds	Value
Almonds.....	9,838,852	\$1,246,474	11,745,081	\$1,520,063	15,009,326	\$1,825,475	14,233,613	\$2,331,816	17,144,968	\$2,410,648
Cocoanuts.....	.....	971,852	.....	1,086,473	.....	1,298,740	.....	1,349,562	.....	1,439,770
Cocoanut meat, broken or copra.....	.....	.....	(a)	(a)	(a)	(a)	7,064,532	302,132	14,121,570	481,232
Cream and Palm.....	.....	.....	(a)	(a)	(a)	(a)	252,538	650,488	310,420	754,155
Palm and Palm nut kernels.....	.....	.....	.....	(a)	.....	(a)	.....	38,962	.....	2,277
Walnuts.....	23,670,761	1,729,378	21,864,104	1,469,463	24,917,028	2,193,653	32,597,592	2,969,649	28,887,110	2,765,486
Other.....	.....	1,523,462	.....	2,082,344	.....	2,055,557	.....	2,100,274	.....	1,790,375
Total nuts.....	.....	\$5,471,166	.....	\$6,158,343	.....	\$7,373,425	.....	\$9,742,883	.....	\$9,643,943

* Yearbook U. S. Dept. of Agr., 1903, p. 686; 1904, p. 728, and 1908, p. 760.

CHAPTER II

PECAN BOTANY

THE aborigines of the country used hickory nuts of different kinds as food, and, in the region in which the pecan grows as a native tree, it was valued by them above all its relatives. Penicaut found in his travels that the Indians stored large amounts of pecans for winter use. The scientific name of the pecan is appropriately derived from two Indian words, "powco-hiccora" and "pacan." There is no reason to doubt but that the Indians were instrumental in distributing it in the different parts of the country. Doubtless they carried the nuts with them on their journeys and planted them intentionally or unintentionally in their rambings. The Indians have had much to do with the distribution of such plants as were useful to them.

In 1785, the pecan was described under the name *Juglans Pecan*, by Marshall, in his *Arboretum Americanum*. In 1818, Thomas Nuttall, an English botanist, separated the hickories from the walnuts and butternuts, putting them under a new genus which he called *Carya*, naming the pecan *Carya olivæformis*. Nuttall's classification was followed for many years until in 1888, it was pointed out by Dr. Britton* that in the year previous to the publication of Nuttall's work, 1817, C. S. Rafinesque, a French naturalist, had separated the hickories along the same lines as Nuttall, and published them under the name *Hicoria*. In accordance with the laws of priority, Rafinesque's name, *Hicoria*, takes precedence over *Carya*.

* Bulletin Torrey Bot. Club, XV, p. 277.

The family *Juglandaceæ* embraces but two genera, *Juglans* and *Hicoria*, the former including the walnuts and butternuts, and the latter the pecan and other hickories. With the exception of the Shellbark hickory, *Hicoria ovata* Britton, and the Big shellbark, *Hicoria laciniosa* Sargent, the pecan is the only one of the genus worthy of cultivation.

In 1896, Dr. William Trelease,* in a study of "*Juglandaceæ*, of the United States," divided the genus *Hicoria* into two sections, *Pacania* and *Euhicoria*. In the first of these he placed the pecan and three of its nearest relatives, *myristiciformis*, *aquatica* and *minima*. This division is useful in showing the relationship of the different hickories.

Family.—*Juglandaceæ* Lindl. Nat. Syst. Ed. 2, 180. 1836. Trees with alternate pinnate leaves and monœcious bracted flowers. Staminate flowers in long, drooping catkins, provided with three or more stamens, and occasionally with an irregular-lobed perianth adnate to the bractlet and a rudimentary ovary. Anthers erect, with short filaments, two-celled; dehiscent longitudinally. Pistillate flowers bracted with a three to five, normally four-lobed calyx and sometimes with petals. Ovule solitary, erect, styles two, stigmatic along the inner surface. Fruit a bony nut, incompletely two to four-celled. Seed large, two to four-lobed, cotyledons corrugated, oily, without endosperm.

Genus.—*Hicoria* Raf. Med. Rep. (II) 5:352. 1808. Trees, with close or scaly bark, odd-pinnate leaves and serrate leaflets. Staminate flowers in slender drooping catkins, borne in groups of three, occasionally on the new shoots, but usually from buds just back of the terminal buds on last year's shoots, calyx naked, adherent to the bract, unequally two-third lobed or cleft; stamens with short filaments, three to ten in number. Pistillate flowers, two to nine, produced on a

* Report Mo. Bot. Garden, VII, pp. 32-36.



Pecan tree at twenty years.

terminal peduncle, calyx four-parted, petals none, styles two to four, short, papillose. Fruit oblong, or obovoid, the husk separating into four parts; nut smooth or angled, bony, incompletely two to four-celled. Seed oily, sweet, edible, or bitter and astringent. Natives of eastern North America and Mexico.

Species.—H. Pecan (Marsh.) Britton. Bull. Torr. Club, 15:282. 1888. Pecan, Illinois nut. A large tree, 75 to 170 feet in height and a diameter reaching 6 feet, with rough-broken bark. Young twigs and leaves pubescent, later nearly or quite glabrous; leaflets seven to fifteen, falcate, oblong—lanceolate, sharp-pointed, serrate, green and bright above, lighter below; staminate catkins five to six inches long, sessile or nearly so, sometimes borne near the base on the young shoots but usually from the uppermost lateral buds on last year's shoots; pistillate flowers terminal on shoots of the current season's growth, produced singly or in clusters of two to nine; fruit oblong cylindrical; husk four-valved; nut three-fourth to two and one-half inches in greatest diameter, roundish, or cylindrical and pointed, two-celled at the base, partition thin, bitter, seed deliciously sweet. Found native on the moist bottom lands along streams from Indiana south to Kentucky and Alabama, and from Iowa south to Texas, principally along the Mississippi and its tributaries, the Colorado river in Texas, and along some of its tributaries into Mexico.

POLLINATION

Since two kinds of flowers are produced on the pecan, one bearing the pistils, the other stamens, the pollen must be transferred from the latter to the former in order that pollination may take place. In many plants, the pollen is transferred from one plant or flower to another by means of insects; but in the pecan there are

no bright colors, no nectar, no scent to attract insects to carry pollen, but, instead, the wind is the carrying agent and it needs no attractions. Pollen is produced in large quantities, necessarily so, since much of it is wasted.

Unfavorable weather conditions at time of blooming may interfere seriously with pollination. Heavy winds or wind-storms, and rains of several days duration, may prevent the necessary and desired distribution of the pollen, as a result of which no fruit is formed.

Sometimes the staminate blooms are destroyed by frost, while the pistillate ones escape. It makes little difference which are destroyed, however, as in either case the result is the same—no fruit sets.

The staminate flowers push out from the lateral buds at the same time the new shoot develops from the terminal one. The pistillate blossom does not appear until the terminal shoot has grown six or eight inches, and in the meantime it is protected by the unfolded leaves. The staminate bloom, on the contrary, is exposed from the first, having no leaves to protect it. In consequence, it is much more likely to be cut off by frost. Dr. Trelease refers to several observations on proterandry (maturing of the pollen before the stigmas of the pistils) in the pecan. This, together with the unprotected condition of the staminate blooms, we believe, accounts in a large measure for the non-setting of fruit on the northern boundaries of the pecan area.

The artificial, or hand pollination, of the pecan is an easy matter, and offers an inviting field for those interested in plant breeding. Emasculation, or the removal of the stamens from the flowers necessary in breeding so many plants, is not necessary in the pecan. All that is needed is to cover the pistillate blossoms with a sack until they are matured. At this time the inner or stigmatic surfaces of the pistils will be exposed and ready for the pollen. The pollen, collected from adjoin-



Pecan flowers. Pistillate flowers enlarged below.

ing trees in bloom or brought from a distance, can then be placed upon the stigmas and the sack replaced. When the fruit is set, the paper sack should be replaced by one of mosquito netting. Some careful work has already been done along this line, and it is hoped that many more will take up the work. Much yet remains to be desired, and varieties may be better adapted to different sections. The very best, large, full-meated, thin-shelled, prolific and precocious variety of pecan for each section has probably not yet been brought forward. It may be accidentally discovered; it may be produced and can be produced by systematic, painstaking work in breeding. It is hoped that the number of workers in this inviting field may be increased. Some may be deterred by the fact that it will take the seedlings so long to come into bearing. But scions may be taken from the seedlings raised from cross-bred nuts, top-worked on large trees, and fruit could be obtained in many cases in a period not exceeding five or six years from the seed. Those which would not produce fruit in six years in this way might perhaps as well be discarded.

CHAPTER III

PECAN GEOGRAPHY

MOST of the tree fruits, cultivated on an extensive scale in North America, are exotics. The orange, apple, peach and English walnut, for instance, are all strangers from other lands, which have found a congenial home in the soil of this continent. But few native species have been brought into cultivation for their fruits. The only ones worthy of note are the mulberry, plums, persimmon, shellbark hickory, big shellbark hickory and the pecan. While the native American plums are very important in some sections of the country, yet it is not too much to say that the pecan far surpasses, both in present and in prospective value, any of the other native fruit trees. It has a wide native and cultivated range, and, while the area to which it is adapted as an orchard tree may not equal that of the apple, yet it closely approximates it. The two areas do not overlap to any great extent, except on the northern and western boundaries of the present pecan area.

NATIVE PECAN RANGE

The pecan is found as a forest tree in the moist bottom lands along the Mississippi river and its tributaries, from Indiana southward to Mississippi, and from Iowa to Texas and Mexico.

This region in which the pecan is, or has been found native, reaches its northern limit at Davenport, Iowa. It skirts the Wabash as far north as Terre Haute, Indiana, and along the Ohio river nearly

to Cincinnati, Ohio. From thence its range extends south to Chattanooga, Tenn., and on to Vicksburg, Miss. From Vicksburg it skirts the Gulf of Mexico at a distance of seventy-five to one hundred miles to Laredo, Texas; thence along the Salado river into Mexico. The western boundary embraces the headwaters of the Colorado river, and returns more or less directly to Davenport, Iowa. The area in which the pecan is indigenous embraces portions of Iowa, Illinois, Indiana, Ohio, Kansas, Missouri, Kentucky, Oklahoma, Indian



Old pecan trees on the Brazos river, Texas.

Territory, Tennessee, Arkansas, Alabama, Mississippi, Louisiana, Texas and Mexico. On the outskirts of this area, it extends farthest in all directions along the streams and rivers, while, on the drier intervening ground, the line does not extend so far from the center of the region. Particularly is this true in southwestern Texas, where the pecan is confined almost solely to river-bottoms.

It has not been generally known that the pecan is native in Alabama, and, therefore, the following item from the pen of the late Dr. Charles Mohr on the *Mesophile* forests of Alabama* will be interesting:

* "Plant Life of Alabama," pp. 100-101, 1901.

"The pecan (*Hicoria Pecan*) and nutmeg hickory (*Hicoria myristicæformis*) are frequently scattered among the oaks throughout the woodlands of this region in the basin of the Alabama and Tombigbee rivers. There can be no doubt about the pecan being indigenous to this region, although heretofore not regarded as a native of the eastern gulf region outside of the Mississippi and Yazoo deltas. Groves of full-grown trees, which must have been in existence before the arrival of the first white settlers, are remembered by very old inhabitants. A few of these landmarks of the original forest growth still survive, surrounded by their offspring of succeeding generations, notably on a plantation near Faunsdale, Dallas county. Generally this tree has disappeared with the oak forest on the fertile lands, and is at present found only in the small groves of oaks saved from destruction, to shade the grounds around the dwellings of the planters."

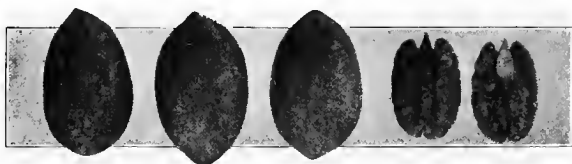
Moisture has been a factor in determining the native range of the species. The rivers have been the distributing agents, and it is along their banks that this hickory has been principally found in a state of nature. The flood waters have often planted the seed far outside the immediate vicinity of the banks of the streams. Along their shores, the Indians camped, and doubtless on many occasions dropped pecans from their store, thus assisting nature in her planting.

CULTURAL AREA

The region in which the pecan is cultivated as an orchard tree is not confined to the limits of its natural range. Plantings have been made outside its native area in the states and territories already mentioned, and besides, its cultivation, in some measure, has been undertaken in the states of Virginia, North Carolina, South Carolina, Georgia, Florida, New Mexico, Cali-

ifornia and Oregon. In many other states, experimental plantings have been made. Leaving these out of consideration, however, it will be seen that in about twenty-three states the pecan is either found as a native tree in the forests or is cultivated in orchard form, or both. The area corresponds in some measure with that in which cotton is grown, though it extends farther north and west than the cotton region.

The attempts which have been made from time to time to cultivate the pecan in the more northerly states have not proved successful, though the author has received pecan nuts from Mr. H. F. Ruhl, Manheim,



Pecan nuts from Pennsylvania, natural size.

Lancaster county, Pa., which were grown near that place. The nuts were small, but plump and of good quality.

In many instances, however, the tree has grown well, but fruit has not been produced. The pistils and stamens of the pecan are not found in the same flower, but in different flowers, borne some distance apart on new and one-year-old wood, respectively. Consequently, it frequently happens that the flowers are not matured at the same time, as a result of which pollination cannot take place. Moreover, late spring frosts often destroy one or both sets of flowers, and the result, as far as fruit is concerned, is the same in either case. As a result of these experiences, the pecan cannot be recommended as a nut-bearing tree north of its natural range in the Mississippi valley, neither

will it succeed at high elevations in the Allegheny mountains. On the grounds of the Mimosa hotel, near Tryon, N. C., there is a seedling pecan which bears well. The elevation is about twelve hundred feet. It reaches its most northerly cultural extension in the Mississippi valley and in the coastal plain of the Atlantic seaboard. But it grows well and makes a good shade tree farther north, and at elevations far above its native range. Even then, however, the nuts from which these seedling shade trees are grown should be brought from the northern sections of its natural distribution. They are much more likely to withstand the rigorous cold of winter, and to escape frost injury to the blooms in spring. In extending the pecan area northward, the seedling pecans of Indiana, or some similar region, should be used as stocks, and the best of the seedling varieties from this same region could be budded or grafted on them. An investigation of the Indiana trees has already been made by Mr. Mason J. Niblack.*

Frequently, the question is asked as to whether the pecan can be grown in a certain given locality. Such a question can be answered only in the most general way. The presence of the larger species of hickories in the vicinity may be used in some parts of the country as an indication of the success which might attend the planting of pecan trees, but such a guide should not be followed too implicitly, and, even if the pecan tree should grow well, fruit might not be secured.

The presence of pecan trees, single specimens perhaps, or two or three, in yards or about buildings here and there throughout a region, may be taken as a guide in the matter of planting, and no better can be had. Nothing will take the place of a practical demonstration in the way of a vigorous fruiting tree.

* See chapter on Pecan Literature.

CHAPTER IV

PROPAGATION OF THE PECAN

It is difficult to propagate the pecan either by budding or by grafting. During some seasons, nearly every bud or graft inserted grows, and in others nearly all fail. Skilled propagators are satisfied with seventy-five per cent. of living buds or grafts, but this result can be obtained only when conditions are just right. Many have to be content with less satisfactory results. The difficulty may be due in part to lack of skill, in part to lack of judgment in selecting good material with which to work, or in part to untoward weather conditions and improper condition of the stocks. In some regions, the poor stand of living grafts is due to the attacks of the bud-worm, *Proteopteryx deludana*, more than to anything else. The buds are eaten out and destroyed by this insect at the time they start into growth. In certain sections, spring working of pecans has been abandoned entirely, owing to the destruction wrought by this pest. But, notwithstanding all these drawbacks, pecan trees can be, should be, and are propagated in large numbers by budding and grafting, and the seedling is becoming more and more a thing of the past.

SEEDLINGS VERSUS GRAFTED TREES

It is a fact worthy of note that the beginning of every tree-fruit industry is marked by the use of seedling trees. In the later stages of the development of the industry, the seedling, owing to a more intimate

knowledge of its failings and shortcomings, gives way to the grafted* tree. This stage has already been reached in pecan orcharding.

It has been stated that a certain percentage of pecan trees would produce nuts identical with those of the parent tree. The author has yet to find the first instance in which this was the case. This truth is borne out by the observations of others.

From whatever standpoint one may view it, the seedling, up to the time it comes into bearing, is an unsatisfactory and unknown quantity. After it comes into bearing, in the majority of instances, it continues to be unsatisfactory. There is the remote chance, of course, that the seedling tree may prove meritorious; but even then large numbers of them are not likely to behave themselves in any way superior to varieties we already have. The risk in planting them for commercial purposes is too great.

In view of the fact just stated, if a planter desires to secure a certain definite fixed variety of pecan, it can be done only by planting grafted or budded trees. Even though all the seedling nuts produced were of good size, yet the variation in time of ripening, quality, prolificness, form and size, would be against them. Take a certain quantity of each of a number of our largest pecans,—Stuart, Van Deman, Delmas, and Frotscher, for instance,—mix them together, and under average circumstances the mixed lot will sell, in the open market, for less money than the same varieties and the same nuts would if marketed separately. Mixed nuts, no matter how good the quality, cannot compete successfully in the market with a single uniform sample of the same or nearly the same quality.

Grafted trees will come into bearing at an earlier age than seedlings. In the case of seedlings, it is very difficult to say when they will begin to bear, while

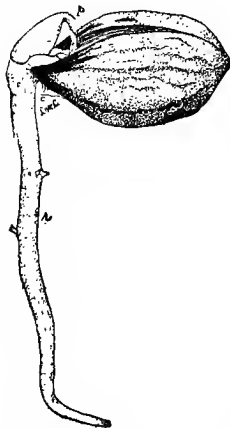
*The term grafted, as here used, embraces budded trees as well.

grafted trees of nearly all varieties may be expected to bear a small crop of fruit in six or eight years (less or more, depending upon the variety) from the time of planting.

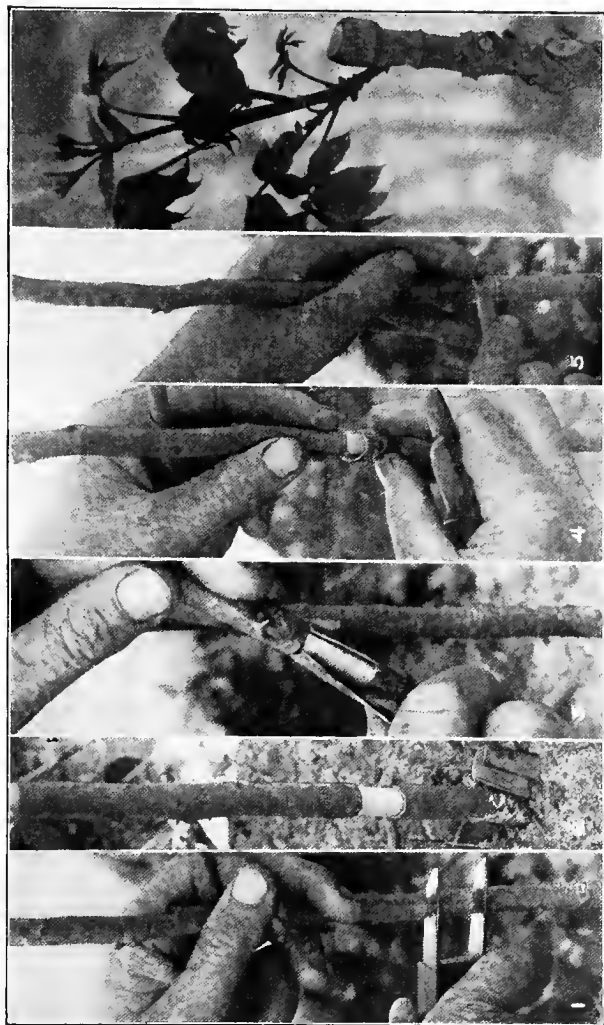
The great objection to grafted trees is the first cost; and yet, in the face of this, it is best to plant grafted trees, even if fewer of them are planted. If grafted trees are out of the question, then plant seedlings and top-work them. Grow the seedlings from nuts, if necessary; but, to those who live in sections where pecans can be grown, let me say, *plant pecan trees*; plant budded or grafted trees, if you can—but plant pecan trees.

PECAN STOCKS

Nursery trees are propagated entirely on pecan stocks, and, in the present state of our knowledge, it is the best stock to use. Moreover, since pecan nuts for raising seedlings are much more easily secured than other hickory nuts, they are not likely to be readily displaced in nursery work. It may be that the pecan will grow and thrive as well on a number of different species of hickory, but definite information bearing on this point is lacking. *Hicoria tomentosa*, *H. alba*, and *H. aquatica*, have been used for stocks in North Carolina, Florida, and other states, the pecan being top-worked upon them. But for the present, at least, until our experimental knowledge is farther advanced, the safest advice is to use pecan stock only.



Pecan nut germinating.
P. plumule; c. cotyledons;
r. tap-root.



Pecan budding, annular method. 1. Cutting ring from stock. 2. Ring removed. 3. Taking bud from stick. 4. Putting bud in place. 5. Tying the bud. 6. The growing bud.

Too little attention on the part of propagators has been given to the kind, source and quality of the seed used to raise stocks for propagation work. The main object held in view in making a selection for seed purposes is to get just as many nuts as possible in a pound. The result of this policy is, that, without question, inferior seedlings are often used for stock; they lack stamina and vigor. Frequently, in a nursery of budded or grafted stocks, or in a young pecan orchard, a wide variation in the size and vigor of the trees can be noticed. No satisfactory explanation has ever been offered, but there seems little reason to doubt that it is due to the use of heterogeneous lots of seed for stock purposes. *The point must be emphasized, that greater care should be exercised in the selection of the seed used in nursery work.* Nuts from rapid-growing, vigorous, healthy trees only should be used, and these nuts should be of good size for the variety to give the young seedling a fair start in life. Many nurserymen follow the plan of rigidly cutting out of their seedling rows all seedlings which do not make satisfactory vigorous growth. This policy is to be commended, as a much higher grade of grafted or budded trees is thereby insured.

As already pointed out in regard to pecan shade trees for more northerly regions, so in the case of pecan nuts for use in raising stocks in northern sections, it is best to secure nuts from trees near the northern limits of nut production. The successful development of pecan growing in the northern sections, in some of which the pecan may even be indigenous, must be based upon hardy varieties worked on stocks raised from nuts grown in these same regions, or in regions having the same climatic conditions. The soundness of this advice, given several years ago, is borne out by the misfortune which befell the fine collection of young shagbark hickories belonging to Dr. Robert T. Morris,

of New York. In the spring of 1910, it was found that many of these trees, worked on southern pecan stocks, had the bark burst open for a distance of two or three inches above the ground, completely girdling them. At the same time, several hundred pecan stocks of smaller size, grown from Indiana nuts, were uninjured.

STORING AND PLANTING SEED NUTS

If pecan nuts, intended for seed purposes, are stored and kept as nuts are ordinarily kept, they become dried out. Before they will germinate the following spring, they should be soaked in water for two or three days, as they must absorb all the moisture lost and considerably more. In consequence of this, they are slow in starting. If too thoroughly dried out, many may fail to germinate.

To obviate this, when nuts must be stored for some time, and to insure better and more prompt germination, it is best to keep the seed nuts in moist sand or clay during the winter months. Procure a sufficient number of shallow boxes or trays; three feet by one and a half feet by six or eight inches will answer nicely. These are to be used in stratifying the nuts. The earth to be used should preferably be good, clean sand, free from organic matter, or, if this cannot be secured, clay will answer. Place a layer of the earth about one inch deep in the bottom of the boxes, then a single layer of nuts, then a two-inch layer of earth, and so on in alternating layers until the boxes are filled. These should then be slightly moistened and set aside in a sheltered place, and covered with pine needles, leaves or straw. In spring, when germination has just begun in the nuts and the tiny sprouts are beginning to appear, they should be planted in rows.

In the more southerly sections, there is no good reason why the nuts should not be planted as soon as the

crop is matured. By doing this, all expense and trouble of storage is avoided, and as good or a much better stand of seedlings will be secured. It is a safe plan to follow, when climatic conditions do not render a deviation from the rule necessary, to plant all nursery seeds as soon as the crop is matured.



A pecan nursery.

The ground for nursery seedlings should be deeply plowed, well broken up, pulverized, and made moderately rich. Ground which produced a heavy crop of cowpeas, velvet beans or beggarweed the previous season, is excellent for the purpose. Farm-yard manure well decomposed and plowed in, the autumn previous, is one of the best manures to use. The ground should be lined off in perfectly straight rows four feet apart.

The cultivation of the seedlings is greatly facilitated by having them in straight rows.

The nuts should be planted three or four inches deep, depending upon their size and the character of the soil. Large nuts should be planted deeper than small ones, and, in heavy soils, nuts may be planted somewhat nearer the surface than in light sandy ones. The rows may be opened with a small turning plow or bull-tongue, or, for lesser areas, with a hoe. Place the nuts four to six inches apart, to allow for selection by cutting out the feeble seedlings. They may be planted by hand or with a planter. Cover with a small plow, if planted by hand, roll the ground if the weather is dry, and then scarify the surface with a weeder or a light harrow, to prevent evaporation of the soil moisture. If the season is dry, it is often a good plan to ridge up a little over the seed row before rolling. This surplus earth should be removed in spring with potato-forks, about the time the nuts begin to germinate; or the ground may be mulched with pine-straw, grass, leaves, or other suitable material.

CULTIVATION OF NURSERY SEEDLINGS

If the ground has been slightly ridged over the seed rows, cultivation should begin with its removal. Even before the tiny shoots appear above the surface, it is advisable to start cultivation, using a very light harrow or a weeder. From the time the young shoots begin to appear above the surface, frequent shallow cultivation should be given. Once every ten days or two weeks is not too often, and the ground should be broken to a depth of one inch or so after every shower of rain. During dry weather, more frequent cultivation once every week will be well repaid in the additional growth and vigor of the seedlings. The best implements for cultivating the seedlings are the weeder, Planet Jr. cul-

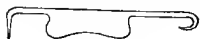
tivator, and the sweep. A good commercial fertilizer, analyzing 5 per cent. phosphoric acid, 6 per cent. potash, and 4 per cent. nitrogen, may be applied to advantage, at the rate of one thousand to fifteen hundred pounds per acre, in two or three applications. If leaf-blight and scab make their appearance, the seedlings should be sprayed promptly with Bordeaux mixture.

By the following autumn, the better seedlings will have ten or twelve inches of top, and two and a half or three feet of tap-root. The succeeding spring many may be whip-grafted at the crown, and by July and August of the following year most of those not grafted should have attained sufficient size for budding. Those which are not of sufficient size at this time can be worked the next spring and summer.

NECESSARY MATERIALS AND TOOLS

The materials and tools used in grafting and budding are: a grafting-iron, a mallet, budding-knives, grafting-wax, strips of waxed cloth and twine.

Of grafting-irons there are a number of different kinds, but one after the general type illustrated here works very well. It will be noticed that the blade is curved at the corners, and the edge, instead of being straight, is curved downward in the center. This type of blade in some measure prevents the bruising of the bark when splitting a branch or stock in cleft-grafting. Such a grafting-iron may be made by almost any blacksmith. However, a good stout knife may be used instead.

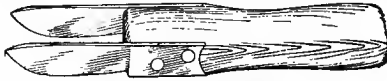


Grafting iron.



Common budding knife.

For use in grafting, an ordinary budding-knife, such as is illustrated on page 30, is well-nigh indispensable. No other knife is so well adapted to making smooth, sloping cuts on the scions.

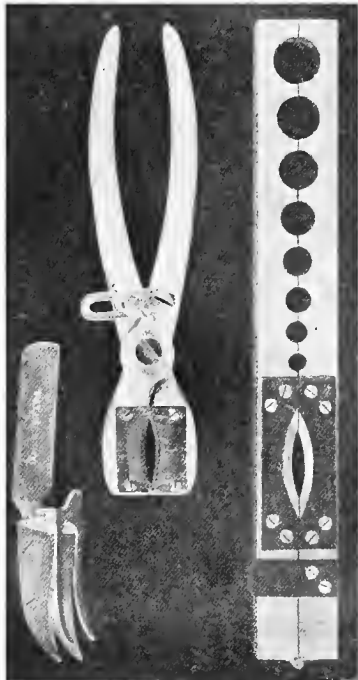


Double-bladed budding knife

buds rapidly and well with nothing but an ordinary budding-knife. In general, however, a budding-knife having two blades, placed parallel, with a space of three-quarters of an inch or an inch between, is best. A very satisfactory knife may be made by fastening the blades of two ordinary stationary-blade budding-knives on the sides of a piece of wood seven-eighths of an inch square, or a little more, if the blades are desired further apart, and four inches in length. The blades can be firmly held in place by means of two rivets.

Three special budding-knives, for use in pecan budding, have been introduced, one by Mr. Herbert C. White, DeWitt, Ga.,

Some persons can insert annular and veneer-shield



Budding tools, Nelson, Galbreath, White.

one by Mr. D. Galbreath, New Orleans, La., and the other by Mr. Wm. Nelson, New Orleans, La. In these knives the blades are fixed seven-eighths of an inch, one and one-eighth inch, and three-fourths of an inch apart, respectively. These make it possible to cut the buds and the place where they are to be inserted on the stock exactly the same size, an essential point in pecan budding. They have not yet come into general use, although well recommended by some who have used them. The White budding-tool is said to be well adapted for use in top-working trees.

☛ A good grafting-wax may be made according to a number of different formulas. Either of the following will be found satisfactory:

- | | | | |
|-----|---|-----------------------|----------|
| I. | { | Resin | 6 pounds |
| | | Beeswax | 2 pounds |
| | | Linseed oil | 1 pound |
| II. | { | Resin | 4 pounds |
| | | Beeswax | 1 pound |
| | | Linseed oil | 1 pint |

Break the resin and cut the beeswax into small pieces. Place in an iron vessel, pour the oil over them and melt over a slow fire. Stir slightly, to insure their being well mixed together, pour out into a bucket of cold water, grease the hands, and, as soon as the mass is cold enough to handle, pull until it becomes light yellow in color. The wax may be made up in quantity and stored in greased tin or wooden boxes for future use.

To prepare waxed cloth, roll the cloth, in seven-inch rolls, about three inches thick. Place the wax in an iron kettle and melt. As soon as well heated up, place the rolls of cloth in the wax and withdraw the fire from under the pot. Stir the cloth about frequently to prevent burning. It takes about an hour to thoroughly saturate the cloth with wax.

For use, the cloth may be torn into strips of desired

width and wound about a stick eighteen inches or so in length, or carried in a box or basket. Use a little grease, to prevent the grafting-wax and grafting-cloth from sticking to the hands.



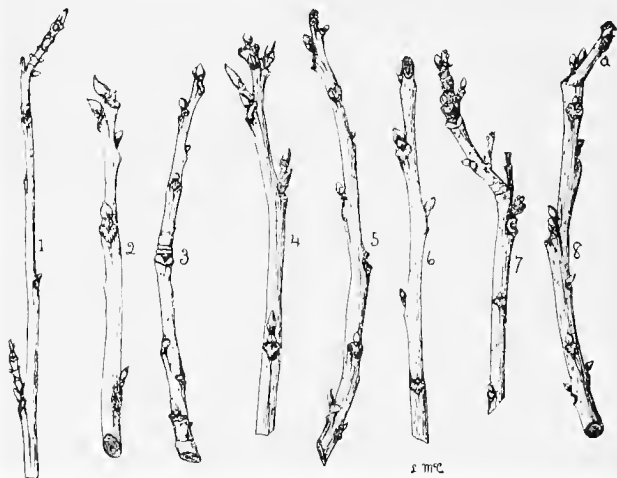
Making waxed cloth.

For waxed twine, procure No. 18 knitting-cotton, and drop the balls into the melted wax and stir them about until the wax penetrates them.

SELECTION OF SCIONS

Great care should be exercised in the selection of scions for use in budding and grafting. Much of the immediate success of the work depends upon the character of the scions, while the health and longevity of the future tree may be materially influenced by the kind of wood used in propagating work. Every propagator should make absolutely certain that the scions he is using, whether for buds or grafts, are of the varieties he desires to increase. If the scions are to be cut from old bearing trees, the tree should be cut back, to

produce good vigorous shoots, suitable for the work. In any case they should be cut only from thrifty, vigorous, prolific trees. Even trees of the same variety differ in these things, and a thorough knowledge of what a tree will do and has done is the only true guide in the selection of scions. It is a well-known fact that desirable qualities can be reproduced and perpetuated by grafting.



Scions: 1-3 Curtis, 4-6 Van Deman, 7-8 Stuart. 1. Poor scion, slender and pithy. 2, 4, 5, 7, 8. One-year scions. 3. Scion partly one- and partly two-year-old. 8. Scion which bore fruit at *a*.

Grafts should be selected from well-matured branches of one year's growth. No. 1, above, shows an undesirable scion. The wood is angular, small, the internodes long, and the pith large in proportion to the diameter. Either terminal portions of twigs may be used or portions back of the tip, but the buds should always be well developed, full and plump—Nos. 2 to 6 are good. For this reason, grafts should not be cut

from wood far back from the tip of the branch. As stated, twigs of the previous season's growth are generally used, but scions composed partly of two-year-old wood may be used, provided the growth is not too large. Scion No. 3 shows one of these. Grafts are generally cut about five or six inches long, and should be from one-quarter to three-eighths of an inch in thickness.

Grafts must be cut while still in a dormant state, and inserted in the stocks before growth starts. The scions may be kept for a considerable length of time by placing them, loosely packed, in damp moss or sawdust, in a box. The box should be covered over, and the scions kept sufficiently moist to prevent drying out.

For bud sticks well developed one-year-old branches, three-eighths to seven-eighths of an inch in diameter, and on which the buds are well formed, may be used. Such sticks frequently show three buds at a node, and, if some misfortune should overtake one or two of these, there is still a chance of success, though the upper one, being the strongest, is generally the one which starts, provided it is uninjured and the bud takes. The degree of maturity of the bud is important, and care should be exercised that only those which are plump, full, and well developed, are used. As soon as removed from the tree, all bud sticks and grafts should be wrapped in damp newspapers, to prevent drying out.

TIME

Grafts should be inserted in spring, or late winter while the trees are still dormant. Generally speaking, January and February are the best months for grafting in the more southerly sections, though the season may be extended from December first to March first. February and March are best for those farther north. Buds may be inserted at any time during the period when the

bark will slip readily. Last year's dormant buds may be carried in storage, and inserted early in the season. They can sometimes be carried through in good shape in small quantities, in an ordinary refrigerator. They must be removed from storage, and kept under proper conditions of heat and moisture, for a little time before they are to be used. When the bud sticks are cut during the dormant season, the bark adheres tightly to the wood and remains so during storage. When removed from storage and kept in good, warm, moist condition for a time, the bark slips readily. Buds of the current season's growth may be used during July, August, and even September. Usually by July they are sufficiently matured for the work, especially in the southernmost parts, of the Gulf states. Very many of the later-inserted buds remain dormant during winter and begin growth in spring. It is preferable that they should behave in this way.

The condition of seedlings in which buds are to be inserted must be carefully watched. They must not be allowed to stop growth, else the bark will tighten, but must be kept in thrifty, growing condition. The ideal time to insert the buds is when the sap becomes of a syrupy consistency. Needless to say, if large numbers of buds are to be inserted, this condition cannot be secured for all of them. But it should be, if possible. If frequent showers come during the budding period, the results are often very unsatisfactory, as the moisture running down the trunks, when the work is being done, makes it impossible to secure good unions.

BUDDING

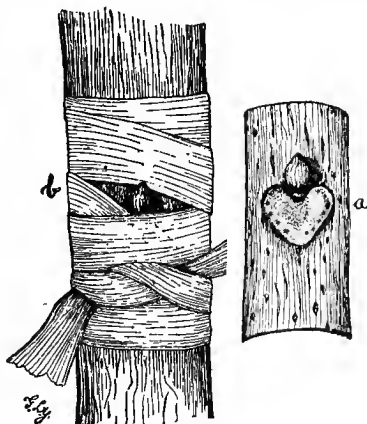
Annular Budding.—A ring of bark about one inch in length is removed from the stock. A bud stick of the same or nearly the same size is selected, and from it a similar ring with a good bud on it is removed by cutting

around the bud stick and slitting down the back or side opposite the bud. This bud is then placed in position on the stock, and securely wrapped with strips of waxed cloth, being careful to cover all cut surfaces. Sometimes the bud is covered, but usually it is allowed to stick out between the wraps just a little. After the buds are in place, some operators place in position a piece of stiff wrapping-paper, tied around the stock just above the bud and allowed to flare out over the bud to protect it from the sun and wind. In general nursery practice, however, this is not feasible. Preferably, all buds should be inserted on the north side.

Stocks from three-eighths to three-quarters of an inch may be worked by this method.

Veneer Shield-budding. (Patch-budding.)

—This method differs from the last only in that the piece of bark removed from the stock and the piece with the bud attached



Veneer shield-budding.

are not complete rings, but only parts. A rectangular, or even a triangular, piece of bark is taken out of the stock, a similar piece with a bud in its center taken from the bud stick is fitted in its place and wrapped as already described.

Mr. George W. Oliver, of the Bureau of Plant Industry, Washington, D. C., has described* a modified method of veneer shield-budding, which has given

*Bulletin No. 30, Bureau Plant Industry, U. S. Dept. Agr., 1902.

good satisfaction in his hands. Instead of removing the patch from the stock, it is slit down the center from top to bottom and the edges are lifted back, the buds inserted beneath, and the side flaps are then tied down over it. He has also found that dormant buds of last year's growth give better results than buds of the current season.

The use of these buds has not, however, come into general use; first, because of the large amount of wood which must be destroyed to secure them; and second, because, in those sections where bud-worms are

prevalent, their larvæ are to be found clustered about the buds until quite late in the season, and make their attack as soon as the buds start to grow.

Chip-budding.—Mr. E. W. Kirkpatrick,* McKinney, Texas, has described a method successfully used by him, as follows: "We prepare the stock to receive the bud by cutting out a section of bark and wood, as shown herewith. The bud is cut from the scion in the same way the cut on the stock is



Chip-budding. Bud cut, stock prepared, bud in place.

made. It should be about the same length, width, thickness and shape of the bark removed from the stock, so that the bud will fit the stock. . . . The bud should be firmly tied until growth begins, usually about twenty-five days, when the string should be cut and the stock also cut just above the bud. . . . All shoots must be kept rubbed off, so as to give the

*"Farm and Ranch," Dec. 3, 1904.

buds the right of way. The small buds about the base of the scions or those on the two-year-old wood are preferred. Where the buds are small and in a cluster, several may be included in one set, and the thinning done after the growth starts."

AFTER-CARE

In from ten days to three weeks, the buds should unite. They should be examined, and if union—indicated by the full, plump condition of the buds or the commencement of growth—has taken place, the wrappings may be removed. It is best to leave them on a little longer than may be actually necessary, to insure a more certain union. Usually the tops are not removed or cut back until the following spring. About the time

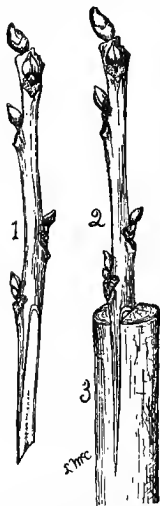


Whip-grafting underground in the nursery row. The earth has been removed and stocks cut off in front of workman; the man behind is filling in the earth.

growth starts, the budded trees will require attention. They should be carefully examined, and the tops of all trees in which buds have taken should be cut back to within about an inch of the bud. Under proper growing conditions, the buds, both the one inserted and others on the stock, will shove out. The latter should be removed, from time to time, as the sprouts formed from them will rob the buds of sap, thereby preventing growth. Later, the stocks are cut close to the bud.

GRAFTING

Cleft-grafting.—Having selected the branch for cleft-grafting and the point at which the scions are to be inserted, the branch should be carefully and smoothly cut off. The limb is then split by using the grafting-iron. If rapid work is to be done, grafts should be prepared beforehand and carried to the field, wrapped in damp paper. In preparing the scion, a sloping cut should be made about one and one-half inches long, cutting into the pith from a point one-half way up the cut down to the lower end. On the opposite side, the cut should not be made to touch the pith, but should be confined to woody tissue throughout its whole length. The knife should have a keen, sharp edge. The cut should be clean, smooth and straight, and the scion should be left wider on the outer side. Start the cuts on each side of, and just at a bud, as illustrated here. Having made the cleft, it is opened with the wedge on the end of the grafting-iron and the scion is placed in position. The cambium layers should be



Cleft - grafting.
1. Scion. 2. Scion
inserted ready for
tying. 3. Stock,
showing cleft.

in contact. Slip the scion well down until the whole of the cut surface is within the cleft. If the stock is large enough, insert two scions. After inserting the scion, it should be firmly held in place by binding the stocks with strips of waxed cloth, after which a covering of wax may be placed over the cloth if deemed necessary. The cut end of the stock should be covered, and, if the scion be other than a terminal shoot, its upper end should be waxed also.

This is the method followed in top-working by grafting.

In nursery work, the ground is removed from the stocks, either with a plow or potato fork, and the unions are made, either by cleft- or whip-grafting, four or five inches below the ground-level. The wrapping is done with four-ply waxed or unwaxed cotton twine, which rots away after a time. The earth is carefully packed around the unions by hand and hoed up to the scions, covering them nearly to their tops. This work must be followed up, as sometimes the earth settles or is washed away by rain, and must be replaced.

Whip-grafting.—Branches which are to be worked by whip-grafting should be less than one inch in diameter. The method is shown in the illustration. A sloping cut, an inch and a half long, is made diagonally across the stock. A corresponding cut is made on the scion, a tongue is raised about the center of each cut by making another cut with the budding-knife held almost parallel to the sides of the wood. The tongue is raised a little on both stock and scion and the two are shoved



Whip-grafting.
1. Stock, showing cut. 2. Scion. 3. United, ready for tying.



One-year pecan in fruit (unusual).

together. If the union is made above ground, it should be securely bound with a strip of waxed cloth, and a layer of wax should be spread over the whole, covering up all the cut surfaces to the exclusion of water, air and the germs of decay. In grafting under ground in nursery work the plan is followed as described under cleft-grafting.

The scion and stock are preferably chosen of nearly the same size, but a scion somewhat smaller than the stock may be used, in which

case the cambium layer along one side of the surfaces in contact should be placed opposite each other, and the projecting portion of the stock is sometimes trimmed off.

CHAPTER V

TOP-WORKING PECANS

MOST of the early orchard plantings were made with seedling pecans. It is needless to say that many of these trees have not fulfilled the hopes of those who set them out. These trees, raised, it is true from the very best selected nuts for which the planters paid a dollar or more per pound, have not come true to name. They have not borne nuts like those planted. In many years of careful investigation covering this point, the writer has not yet been able to find a single pecan tree which bears nuts exactly like the one from which it was grown. Variations from the parent tree may occur in many important directions other than in the nuts themselves. Some are irregular, shy bearers; some are extremely slow in coming into bearing; others, when they do condescend to produce a few nuts, bear small-sized inferior ones, not larger than ordinary playing marbles, while some produce large crops of marketable nuts. Some are unhealthy, subject to the attacks of rosette and scab. It goes without saying that such pecan plantings are unprofitable. What is to be done with them? Briefly, this: Cut out and destroy those affected by genuine rosette, those which are unhealthy, and top-work the remainder of those which do not produce a sufficient quantity of marketable nuts of good quality.

In relation to the control of scab by top-working, an experiment carried out by the author may be of interest. It is a matter of common observation that some varieties, nondescript seedlings and named varie-

ties as well, are subject to scab. For a number of years a seedling was under observation which never produced any perfect nuts because of attacks of this fungus, *Fusicladium effusum* Wint. Adjoining seedlings in the same row showed no signs of attack. In March, 1908, the top was cut back, and the sprouts thrown out were



Top-working by budding. Tree at right just cut back. Second tree from right, one-year top and also new buds just starting to grow.

very severely attacked by the disease, some being killed outright. In August it was top-worked, using Curtis buds, of which forty-seven were inserted. An imperfect stand was secured, about half the number of buds grew. Seedling shoots were allowed to come out again for budding in 1909. Hence the Curtis shoots and

seedling shoots grew side by side in the top during the season of 1909. The seedling shoots were as badly attacked as ever, yet the Curtis branches, twigs and leaves, showed no signs of the disease, and at this date, August, 1910, they are entirely free from the disease. The shoots were rebudded in August, 1909, and it is now carrying a complete Curtis top, one seedling branch excepted. The latter is still diseased.

The question naturally arises, how many crops will

be lost in top-working a bearing pecan tree? In case of nearly all varieties, grafts inserted in spring or buds inserted in summer will bloom, and occasionally hold some fruit the second season following, and quite a number of nuts can be gathered the fourth October following. In the writer's experience, for instance, buds inserted in the tops of trees in August, 1907, produced a few nuts in October, 1909, and have set a very fair crop for harvesting October, 1910. In some cases this may be improved upon, but the above results are a fair average of what may be expected. Generally the blooms produced the first season are nearly all staminate, and it is not until the second season of blooming that a sufficient number of pistillate blooms are produced to yield a crop of any size.

Top-working may be profitably applied to another class of trees; pecan trees in their native woods and thickets, and in some cases hickories, viz: *Hicoria tomentosa*, *H. alba*, and *H. aquatica*, may be top-worked. In the river bottoms of Texas as well as in other states, there are large numbers of pecans which bear small and inferior nuts which can be worked to good advantage. Of course, the very large trees would be almost out of the question. But there are small and medium-sized trees which can be easily handled. The very large trees can, of course, be top-worked. Mr. E. E. Risien has been successful with trees of quite large size, but trees not exceeding thirty feet in height, with a diameter of twelve to eighteen inches, are much more easily managed. If of too large size, they may lack the power to make vigorous growth in the buds or grafts placed in in their tops.

Our knowledge is not sufficiently advanced in regard to top-working on hickory to warrant us in making any very strong recommendations, but the author has seen a large number of pecans worked on hickory, a few of which were in bearing, and all appeared

healthy and vigorous. There is no good reason why hickories cannot be top-worked to advantage, and attempts in this direction will amply repay the amateur nut culturist for the trouble taken.

Again, seedling trees may be grown or purchased and set out in orchard form, with the express purpose of working them over. When these have grown to an inch or two in diameter and have developed several branches, they may be top-worked. This method of securing an orchard of good varieties is somewhat slow, and is open to the objection that the buds or grafts frequently fail to take, and, in consequence, the task of top-working extends over a number of years, resulting in trees with tops of irregular size and shape and of different ages. But by this plan an orchard of desirable varieties of pecans can be secured at little expense, and, provided time is not a consideration, the plan will work out satisfactorily. It should not be attempted, however, unless the owner is able to do the top-working himself. It is not so good a plan as to plant good budded or grafted trees to start with, but it is immeasurably better than planting seedlings with the intention of allowing them to remain common seedlings.

METHODS OF OPERATION

Trees may be top-worked either by budding or by grafting, and it will be best to consider these separately. If the trees are to be grafted, the work must be done before growth starts in spring, and, in most localities where pecans are grown, February is an excellent time at which to graft. If the trees are to be worked over by budding, they should be cut back at this same time; for, though buds may be inserted directly into smooth-barked branches in the heads of vigorous, growing trees, it is best to develop new shoots in which to insert them.

It is not advisable to top-work the lower branches of trees subject to overflow. There is danger of the buds or grafts being broken off by the current or by floating driftwood. Generally, in such cases, it is best to top-work only that portion of the tree which is above high-water mark.

In removing large branches, there is always danger of splitting because of their heavy weight. This may be entirely obviated by sawing upward from the under side of the branch, cutting up through the branch as far as possible, then cutting from the upper side downward. The cut from the lower side should be made further out on the branch, the one from the upper side being made at the point where it is desired to remove the branch. In cutting off the branches, lower ones should be removed first, and the work continued toward the top of the tree. All cut surfaces should be well covered with white-lead paint, to prevent decay. When the older and larger trees are top-worked, only a portion of the branches should be removed at one time. If the whole top be removed at once, the tree suffers a severe shock. Two or three years may be necessary to top-work a large tree, a half or a third of the top being removed and replaced each season. If the trees are of smaller size, thirty feet or so in height and less, the whole top may be cut off and worked at one time. It is not best to insert grafts in very large branches, as it is difficult to get them to heal over properly.

TOP-WORKING BY BUDDING

In favor of the method of top-working by cutting back and budding, attention may be called to the following: The original form of the seedling tree is preserved, and, since the larger branches are generally well placed on seedling trees, a well-shaped head is secured. No attention need be given the buds more

than to remove the seedling sprouts that may be thrown out on the trunk and branch stubs. In trees top-worked by grafting, it is necessary to tie the shoots either to branches or posts placed for the purpose, or to each other, or to the trunk of the tree. This is troublesome and expensive. In handling seedling trees in the tops of which several hundred buds had been



Top-worked pecan. Four buds inserted.

inserted, the loss by breaking off by wind and rain has been less than one per cent. The work can be more economically done in this way than by grafting, and the time required to form a good head is decidedly less.

To give, in detail, the cost of the work, it will be interesting to introduce, at this point, the actual cost of top-working eight seedling trees in 1908. The trees were between twenty-five and thirty feet high, and from ten to twelve inches in diameter, eighteen inches from the ground. They were about fourteen years old. Some of them had never borne, others had borne a few inferior nuts, and one was affected with scab to such an extent that very few perfect fruits had ever been produced.

The cost of cutting back the eight trees and painting the stubs was as follows:

March 3, 1908, one man one-half day, at \$2	\$1 00
March 4, 1908, one man one day, at \$1.65	1 65
Total	\$2 65

The average cost was thirty-three cents per tree. All branches of good size, an inch and over in diameter, were cut back. Smaller branches, i. e., those less than an inch in diameter, were removed entirely, as they would not produce strong shoots. As soon as removed, a good coat of thick white-lead paint was applied to the cut surface.

The spring and summer months were very favorable for growth, and a good crop of sprouts was produced. Some of them were an inch in diameter in August. These trees were budded as follows:

Tree No.	Date	Variety	No. of buds
1.....	August 5, 1908.....	Success	48
2.....	August 12, 1908.....	Delmas	47
3.....	August 12, 1908.....	Stuart	33
4.....	August 12, 1908.....	Schley	29
5.....	August 13, 1908.....	Van Deman	51
6.....	August 13, 1908.....	Teche	51
7.....	August 13, 1908.....	Curtis	50
8.....	August 14, 1908.....	Curtis	47
Total buds.....			356
356 buds at 1 cent each			\$3 56

The expense of inserting the buds was as follows:

One man one-half day at \$1.35	\$0 67½
One man one-half day at \$1.65	82½
One man two days two and three-fourths hours at \$2... ..	4 55
Total	\$6 05

To the items already enumerated must be added the following items for removing the wraps, cutting off the ends of the budded branches, and removing the sprouts:

August 26, 1908, one man, two hours at 20 cents	\$0 40
September 3, 1908, one man, three-fourths day at \$1.65... ..	1 24
April 15-16, 1909, one man, one and one-half days at \$2... ..	3 00
Total.....	\$4 64

Taking the total of the above items, we have a cost of \$16.90 for top-working the eight trees, or an average of \$2.12. Besides this, some little time additional was given, which would have run the cost up to approximately \$2.25 per tree.



A two-year top-worked Van Deman pecan tree.

The work could undoubtedly have been done, and well done, for less than this amount. If the trees had been budded with a single variety, a saving would have been made, as the above included the cost of cutting the buds and everything, and besides a lesser number of buds could have been used.

When the heads were removed, the stubs were left from twelve to eighteen inches in length. After paint-

ing, which was done immediately after cutting them off, no subsequent attention was given until August, when the buds were inserted.

As a larger number of shoots developed than we desired to bud, it was necessary to thin them out. The plan followed was to leave from one to three or four shoots on each stub, the number depending upon the diameter. Roughly, the rule followed was to leave one shoot for each inch of stub diameter. In thinning out, preference was, of course, given to the largest, best-placed and best-attached shoots, these being allowed to remain. It was found best to begin at the bottom of the tree and thin out toward the top. It is much easier to get up into the top after the shoots are thinned, and there is much less danger of injuring them.

When the buds were inserted, the work was begun at the top of the tree and finished at the bottom. This plan avoided injury to the buds already put in, for it is impossible to climb about on the stubs among the shoots, hanging on almost like our pre-historic ancestors, without undoing some of the work already done. As soon as the work was finished on each tree, a label was attached, and note made of the variety, its location, and the number of buds inserted.

Two ladders were used—a long one and an ordinary step-ladder. The latter was found to be the more useful, as most of the higher shoots were worked by climbing about on the stubs.

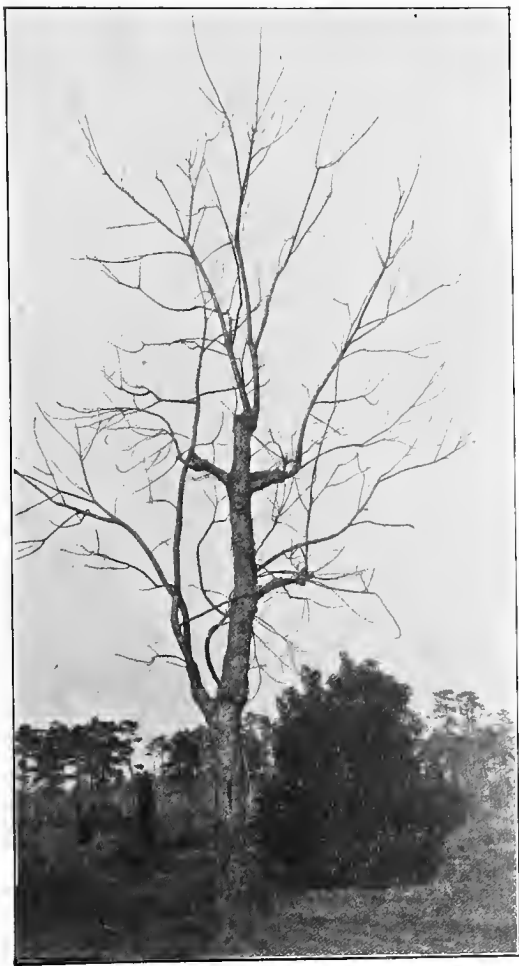
The ordinary annular or ring bud was used, the buds being inserted as close as possible to the end of the stubs. It was usually found that the shoots were curved and not quite round close up to the stubs. Hence, the point of insertion was usually about four or five inches from the base of the shoot. The buds were cut in rings one inch long, the rings removed on the shoots being of exactly the same length. Particular care was taken in tying the buds in place, two wrap-

pings being frequently used. In fact, careful wrapping is a most important item in pecan propagation, and poor wrapping is a frequent cause of failure. Air and moisture must be excluded if successful results are to follow. A knife made by riveting two blades on opposite sides of a piece of tough wood, one inch wide and one-half inch thick, was used throughout.

TOP-WORKING BY GRAFTING

This method has the advantage of saving one season of growth, as the grafts are inserted immediately following the removal of the branches in February, instead of waiting until August, as is the case in budding. Some have followed the plan of combining both methods, and this has its advantages. The disadvantages of the grafting method are that, in some sections, it is extremely difficult to get the grafts to unite, and budding appears to be the more certain method. Where this difficulty is not encountered, the grafts make a vigorous growth, but are very prone to injury from heavy winds or, more particularly, winds accompanied by rain.

Cleft-grafting is the method best adapted to large branches, while the whip-graft may be used on smaller ones, not exceeding three-quarters of an inch or an inch in diameter; any branch larger than this should be cleft-grafted, and it is open to question whether branches exceeding two and a half or three inches in diameter should be grafted, for reasons already mentioned. The method of procedure should follow the general rules laid down for budding. The work of grafting should begin at the top of the tree and progress downward. The cut and split surfaces, after insertion of the scions, must be carefully covered with grafting-wax and waxed cloth. The writer has had excellent results in cleft-grafting small branches by simply using waxed cloth.



An old pecan, top-worked by grafting in the branches.

For several months after the scions have commenced to grow, they have only a very slight hold on the stock. As the growth is usually very vigorous and the leaf surface is great, considerable injury may be done by wind and rain. To prevent this, the young shoots may be tied together or fastened to other portions of the stock. When this is done, care should be taken that the twine used does not do injury by cutting into the wood. To prevent this, a piece of burlap should be placed around the branch beneath the twine, and the twine should be removed as soon as it has served its purpose.

The top may also be supported by lashing a pole against the side of the trunk and fastening the grafts to the upper portion of this, or a pole may be driven into the ground at some distance from the trunk, bound to a branch or stub above and used to support the fast-growing shoot. After the top has grown sufficiently to take care of itself, these posts can be removed.

The cost of top-working by grafting is somewhat in excess of the budding method, because of the considerable amount of care which must be given the new top after it has started to grow.

CHAPTER VI

SOILS AND THEIR PREPARATION

THE pecan succeeds on such a wide range of soils that it is really easier to list those on which it should not be set than it is to enumerate those on which it may be planted. Of the soils not adapted to it, deep sandy lands, soils underlaid with quicksand close to the surface, soils with hardpan subsoil, wet, sour, poorly-drained lands, and stiff, pasty clays, may be mentioned particularly.

If pecans are planted on land with a quicksand subsoil, the roots are unable to make their way downward through the quicksand. So far as being able to take a downward direction is concerned, they might as well be planted on top of a plate of metal. The writer once planted a few nuts on such a soil, to see what they would do. At the end of three years the tops were about two feet in height; the tap-roots, while thick and stocky, were not more than six inches long. They stopped abruptly after numerous efforts to penetrate the quicksand. In normally developed trees of the same age, the tap-roots would have been three or four feet long. The same objections hold against soils underlaid with a hard, impervious layer.

While the pecan is at home on rich, alluvial river-bottoms, subject to overflow, yet it will not grow successfully on damp, soggy lands. It should not be planted on such soils unless they can be well drained, and not then until they have been limed and cultivated for some time, to counteract the acidity of the land.

We can definitely say that the pecan will do well on

alluvial river-bottoms, on sandy, loamy soils with a clay or sandy-clay foundation, on sandy-clay lands with clay predominating, on the flat woods sandy lands so common in the southeastern Gulf states, and on the higher uplands, where hickory, dogwood, holly and oak abound.

It is a fact worthy of note, however, that on extremely rich soils the pecan will make wood growth at



Pecan tree grown on quicksand. Note the tap-root.

the expense of fruit, while on lands containing less fertility less growth is developed with a proportionately large amount of fruit.

Choose not the poorest soil, by any means, but a good, sandy loam in which there is a considerable amount of humus. A subsoil containing a very considerable amount of clay is to be preferred, by all means, for such a soil, with intelligent management, will gain rapidly in fertility.

Since there is so much good land in the pecan area, land thoroughly adapted for the best culture of the

tree, it seems too bad that trees should be set on soils not suited to their requirements.

PREPARATION

The preparation of the soil should be complete and thorough. It may be stated, as an axiomatic truth, that the soil cannot be prepared for trees so well after they are planted as it can before; and nothing is to be



Velvet beans, to improve the soil.

gained by planting the trees in poorly prepared land. Better, by all means, to spend a year or more in getting the land in shape.

If the land is covered with a growth of timber, this should be cleared away, and the ground cultivated for a year at least before the trees are set. Corn is probably the best crop to grow on new land, and at the last working cowpeas should be sowed. On fairly good land this will be sufficient, but on poorer ground the land should be continued in cultivation another year,

sowing it down in beggarweed, cowpeas, soja beans, or velvet beans. These crops should be plowed into the soil in autumn or early winter, after they are dead and dry.

On lands which have been cultivated for some time, these same crops should be sowed for one season, at least, previous to planting. Every effort should be made to insure a good stand and a good growth. Inoculation of the seed with nitrogen-gathering germs will help, and a good fertilizer, such as the one recommended for these crops elsewhere, should be applied. Nothing will insure a good growth in the young trees so well as the nitrogen and humus added to the soil by leguminous crops. Stable manure may also be used to advantage.

The ground should be deeply and thoroughly broken with a two-horse plow. In many cases, the soil conditions will be greatly improved by the use of a subsoil plow, running it after the ordinary plow, so as to break and loosen the soil to a depth of twelve or fifteen inches, or even more.

CHAPTER VII

PURCHASING AND PLANTING PECANS

SINCE, in most cases, the trees are to be set in late autumn and early winter, these trees should be purchased in late summer and early autumn. Do not leave the purchasing of the trees until the last week, or the last minute, before planting, but buy in good season, i. e., several months before planting time. Too many forget about the trees until the time for setting them out has come, and not infrequently the matter is forgotten until after the season for planting is long since past.

The number of varieties in the commercial orchard should not be large. No greater mistake can be made than that of planting a few trees each of a large number of different varieties. Four or five, at most, are sufficient; get fewer varieties, rather than more. One variety alone should not be planted, as it is generally believed that something is to be gained by having two or three varieties to provide for cross pollination. This perhaps rests more on theory than on actual demonstration, but it is not a dangerous theory, at least, but one that will put the planter on the safe side of the question.

Trees can be purchased in two ways: They can be secured direct from the nurserymen (usually by catalogue), or they can be purchased from agents. By far most of the pecan trees are bought from the nursery, and by many this method is preferred. If trees are secured from agents, be certain that they are responsible persons, representing responsible firms; be certain

that they are properly accredited, i. e., have certificates to show whom they represent, and, if they have not these, then send them off down the road, and the dog

with them for company, if necessary. This may seem to be harsh advice, but, had it been followed by many purchasing pecan trees in recent years, it would have been much to their advantage. Plenty of seedling trees have been bought and planted in the belief that they were good grafted or budded stock.

But agents with all sorts of credentials have represented firms which were not honest. Budded and grafted trees of certain well-known varieties of pecans have been sold, which were not these varieties.

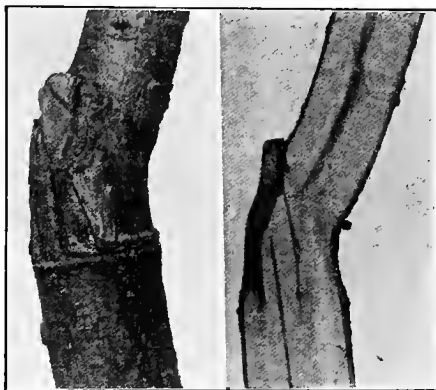
There is every reason to believe that scions have been taken from



Nursery pecan tree. Good root system.

ordinary seedling trees of any kind, inserted in stocks, and sold for the best varieties, and that a large number of trees have been substituted and sold for what they were not. The prospective planter must depend upon the honesty and integrity of the nurseryman, and should inform himself on this point.

The National Nut Growers' Association has done no greater service to the pecan industry than that which they have rendered in protecting the public from fraudulent agents and nurserymen. Happy is the nur-



External and longitudinal interior view
of bud union.

seryman whose reputation for square dealing merits the trust and confidence of tree-planters throughout the country.

DETECTING BOGUS TREES

How may budded or grafted trees be distinguished from ordinary seedlings, or from "doctored" seedling trees? Many people have purchased seedling trees at a dollar or so per tree, under the supposition that they were budded or grafted stock. It is well to know something of the distinctions between them.

If the trunks are straight and smooth, with bark

uniform in appearance throughout, the trees have not been budded or grafted, unless the point of union is at the ground, and, the trees having been grafted, a terminal bud on the graft has grown. If the young trees have been budded, the trunks will not be straight; a bend will be seen at the point where the bud was inserted, and the scars of the union of the veneer-shield



External and longitudinal interior view of whip-graft union.

or annular bud and the point at which the stock was cut off will be distinctly noticeable. The bark above the point of union on the grafted or budded stocks will be different from that below. There is something characteristic about the color and appearance and the number, size and shape of the lenticles of each variety of pecan, and while it is impossible to describe this difference in appearance (it can be learned only after a large amount

of experience and observation), yet the very striking difference between the seedling stock and the wood of the variety worked upon it will serve as a useful index to the genuineness of the tree in question.

If the trees have been grafted instead of budded, the same statement will be true of the appearance of the bark. But the tree will be more nearly or quite straight, and the marks and scars at the point of union will be different. If the trees have been propagated by whip-grafting, the scar will be shaped like the letter N, the scar on young trees covering nearly or quite the whole distance across the stock. If the trunk of a whip-grafted

tree is split through the point of union, the N-shaped mark in the form of a dark line may be distinctly made out, as shown in the illustration. In trees propagated by cleft-grafting, the union scar will be long, slim and V-shaped.

But, to make the similarity between the bogus and the genuine trees more striking, the practice has been resorted to of scarring the stocks, so as to make them resemble the genuine article. This we have known to be



Annular bud growing (left). Split through same (center). A normal branch union (right). Pith non-continuous (center); continuous (right).

done, more particularly in the case of budded trees. Incisions were made in the trunks of seedling trees, to resemble those made in inserting a veneer-shield or an annular bud. The incisions were made so as to include a bud, and the top of the seedling tree was then cut off just above the bud. A tree doctored in this way makes a very close imitation of the real article, and the buyer needs to be on his guard. But the appearance of the bark, as already noted, will serve as a guide. If in doubt, it may be well to sacrifice a few trees and cut them carefully open down to the pith just

through the point of union. *If the trees have been doctored, the tissues of the wood and the pith will be continuous; but, if the trees are genuinely budded or grafted, the tissues and pith will not be continuous.*

Finally, if still in doubt, send two or three trees to the botanist or horticulturist of the Experiment Station of your state, and ask his opinion.

WHAT KIND OF TREES TO PLANT

It is important that the trees planted should be of good quality. The three things requisite as a foundation for success are good land, good trees, careful planting,—and not the least important of these is good trees. It is a mistake to plant trees of poor quality and give them the care and attention that might as well be bestowed on good ones. The cost of maintenance is the same in either case, and the initial cost of the trees is not to be considered when the after-cost and future welfare of the trees are counted at their true value.

Pecan trees are usually graded by nurserymen in about the following sizes: 1–2 feet grade; 2–3 feet grade; 3–4 feet grade; 4–5 feet grade, and 5–7 feet grade. These grades, in good, thrifty stock, are usually one-year buds; though some of the 5–7 feet grade may be two-year buds, having made but a small growth the first season and reached the largest grade the second. The difference in the size of these trees is caused by difference in the size and vigor of the stocks, the vigor of the scions or buds used in propagation, the distance apart in the nursery rows, and the care, fertilizer and cultivation they have received. The basic difference, however, is vigor and thrift whether of scion or stock. The most desirable of these sizes for the planter are the 3–4 feet, 4–5 feet and 5–7 feet grades. The smaller sizes do not represent in themselves the best

qualities desired in a tree, and they are much more subject to accidents after planting, because of their small size. The age of the tree is worth considering.

In nursery work, the age of the tree is counted from the number of seasons of bud growth. One-year grafts are often sold on two-year stocks, but may be on three-year stocks, while one-year buds are usually on three- or four-year stocks. In the author's opinion, three- or four-year stocks are best, as the age of the root has an influence on the time at which the tree will come into bearing. At the same time, the root must not be too old and too large, else the danger of loss in transplanting is materially increased. Old trees are difficult to transplant and, except in small plantings where they can be given special care, they are not best. For general field plantings, the larger grades of one-year buds are preferable, though the author has had most excellent success in planting out thrifty two-year buds of 7-9 feet grade. Much depends upon the tree and how it has been grown.

Needless to say, the stock should be thrifty and



Young Schley pecan tree.
Well started.

vigorous, with well-developed and matured wood and buds. Nothing is to be gained by planting stunted, hidebound trees. The condition of a tree can be readily determined by the fresh condition of the bark and the character of the buds.

Freedom from insects and diseases is also a matter of importance, and, in this particular, thrifty one-year buds are best, as they are less likely to carry any infection. As a matter of fact, however, well-conducted nurseries are not likely to send out diseased trees.

COST OF NURSERY STOCK

At present, the prices quoted for one- and two-year-old stock of standard varieties varies from 50 cents to \$2 per tree, in small numbers, with considerable reduction for trees in lots of one hundred or one thousand. It is not improbable that these prices may be somewhat reduced within the next decade, as greater efficiency is gained in propagating.

The price charged by different nursery firms is, of course, not always the same. In some measure, these differences in prices are due to economies in growing, but, in other cases, the increased price represents greatly increased care in growing the stock.

PLANTING TIME

The best time to plant pecan trees is during the months of December, January and February. Planting should not be delayed until late in spring, as the percentage of loss will be very materially increased. Preference must be given to the earlier portion of the planting season, as the wounds on the roots will have had time to callus over, and the ground will be firmly packed about the roots by the winter rains. Then, with the opening of

the growing season in spring, the trees will be ready to make a good, vigorous start.

HOW FAR APART

The number of trees which may be set to advantage on any given piece of ground is governed by the quality of the land, the amount of plant food, the amount of moisture, and the individuality of the grower. As a matter of fact, no distances can be set which will answer the needs of trees under all conditions, and the problem should be carefully considered in relation to the grower's objects and the piece of ground on which he may be working.

On land of good quality—rich soil—the trees should be set farther apart than on poorer soil, for they will grow to larger-tree size and should be given sufficient room for their best development without crowding either tops or roots. It is plain that in orchard planting there is competition at both ends of the trees—at the roots for food and moisture and at the top for light, and this competition should be reduced to a minimum. This will result in more vigorous trees and larger crops of fruit of better quality. But the crowding of the tops may be governed by judicious pruning, and root competition may be equalized by the addition of plant food and water to the soil. Frequently, however, the fact is overlooked that what may be ample distance apart for trees the first ten years after planting will not be sufficient the second ten years, or the succeeding twenty, forty or fifty years as the case may be. We must look ahead. And, again, many of us plant trees closer together than we know to be best, with the avowed intention of giving space later on by removing every other tree. When the time comes, however, that the thinning out should be done, we haven't the nerve to do it.

In old orchards of most fruits, it has been proven by careful observations that trees given a good distance are in better health and give larger yields than those closely set. Yet it must be admitted that in the case of varieties which are precocious, i. e., come into bearing early, close planting is an advantage. The plan might be followed if we would only do the necessary thinning at the right time.

The best straightforward advice that can be given is to give the trees a good distance, and make the mistake on the side of planting too far apart, rather than too close. Unfortunately, nurserymen and tree sellers often urge too close planting, for the simple reason that more trees will be required for the planting. This is not fair, and every planter should know something about the tree's habit of growth and its requirements.

It is doubtful whether pecan trees should ever be planted closer than forty feet apart, even on light lands; while, on heavier soils, this distance should be increased to sixty, seventy-five or eighty feet.

TABLE OF DISTANCES

Distance	No. of trees	No. of trees
	Rectangular system	Hexagonal system
38 x 40 feet	28	..
38 x 42 "	27	..
38 x 50 "	22	..
40 x 40 "	27	31
40 x 42 "	25	..
40 x 48 "	22	..
40 x 50 "	21	..
40 x 54 "	20	..
40 x 60 "	18	..
50 x 50 "	17	19
50 x 54 "	16	..
50 x 60 "	14	..
60 x 60 "	12	13
60 x 70 "	10	..
70 x 70 "	8	9
80 x 80 "	6	..
100 x 100 "	4	..

To find the number of trees that can be set on an acre for any distance not given in the above table, multiply together the distances apart in feet, and divide the product into 43,560, the number of square feet in an acre. The result will be the number of trees which can be put on an acre of ground.

PLANTING SYSTEMS

For setting orchards, a number of different systems may be used, but the two best adapted to the pecan orchard are the square, or rectangular, and the hexagonal, or septuple. If mixed plantings, such as pecans and peaches or figs, are to be made, then the quincunx system should be used, and a "filler" tree set in the center of the square or rectangle formed by every four pecan trees.

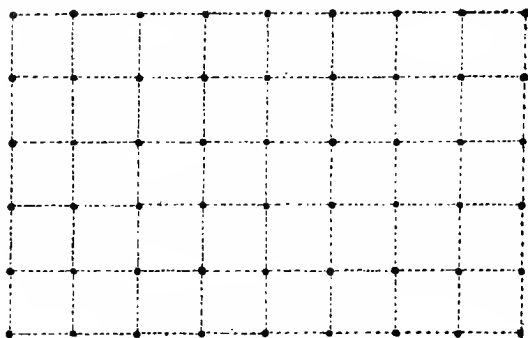
If the trees are to be given entire possession of the ground from the beginning, the hexagonal system is preferable; but, if inter-cropping cultivation is to be followed, the rectangular plan is the better one on which to plant.

Square, or Rectangular System.—In this system are included only the methods of setting trees in rectangles, either square or oblong. It is by far the most commonly used of all the systems, and the ease with which a field can be laid off in rectangles, is greatly in its favor.

The rows of trees intersect each other at right angles, and cultivation may be carried on conveniently either crosswise or lengthwise of the orchard. The planter has the choice of placing the trees the same distance apart both ways, or of planting them closer together in the rows than the distance between the rows.

It has been argued that space is not equally divided among the trees, and, while this is apparently true, yet, on the other hand, the roots of pecan trees, in most cases, penetrate and permeate all the space allowed in

ordinary distances. The roots will certainly secure all the food and moisture in the top two or three feet of soil.



Rectangular planting system

When trees are to be planted by this system, the stakes must be set so as to be exactly in line, whether viewed from the end or from the side of the field.

Hexagonal, Septuple, or Equilateral-triangle System.—By this system six trees are set equidistant from a seventh placed in the center. The basis of the system is not the square, but the circle, since the radius of the circle is approximately equal to one-sixth of the circumference of the circle. The name septuple, sometimes applied to this system, refers to the fact that the number of trees in each group-unit is seven. Equilateral-triangle system refers to the planting of the trees in equilateral triangles, but is identical with the hexagonal or septuple.

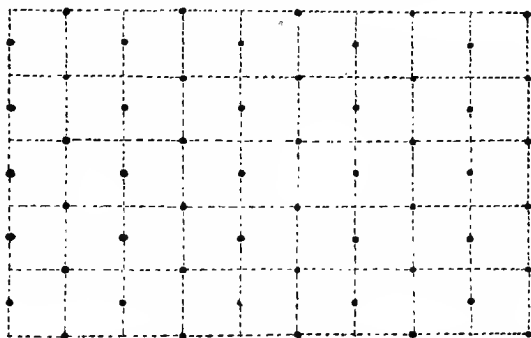
It is the only system whereby each tree is placed equally distant from each of its adjoining neighbors, and the only system which equally divides the space among the trees. By this method about fifteen per cent. more trees can be set per acre than by the rectangular.

For permanent plantings, at regular distances, this system and the rectangular should be recommended before other systems

LAYING OUT BEFORE PLANTING

Level and smooth the ground, harrow and pulverize thoroughly, then proceed to stake the ground off, placing a stake for every tree.

Laying Out Squares or Rectangles with the Plow.—If a good plowman can be secured, very satisfactory work can be done with the plow. In some cases, a man can be found who needs nothing in the way of a guide except two or three stakes. But with a sufficient number of stakes and a marker attached to the plow, good results can be secured by almost any plowman.



Hexagonal planting system.

Furrows should be run both lengthwise and crosswise of the field, their intersections marking the place where the trees are to stand. At each one set a stake.

It is essential that a true, square corner should be secured. This may be done by sighting with an ordinary carpenter's square set upon three posts.

Laying Out in Rectangles with a Wire.—A wire, long enough to reach down one side of the field, should be provided. Stretch this straight out between two posts and mark off upon it the distance which the trees are to stand apart. At each point marked, firmly twist a piece of small wire about the larger one. These should then be soldered in place. It will not do to have them shift. This wire may be rolled upon a roller when not in use.

Measure off along both ends of the field, and set small stakes on the tree rows at the marked places on the wire. Tightly stretch the wire down the first tree row attaching it firmly at the ground level to a pair of good, stout posts. Then plant a lath stake at each mark on the wire. Set all of them on the outside of the wire, so as not to interfere with moving it. When this row is completed, lift the end stake with the wire attached, stretch on the second row, set the stakes as before, and repeat the operations until the work is completed.

Laying Out in Hexagons.—Stretch the wire down one side of the field and firmly set the tree stakes, or stake out the base line by any method, firmly setting a stake for each tree. Then procure two pieces of wire with rings at each end, the length of each wire and ring to be exactly the distance between the stakes as set on the base line. Stretch these wires out toward the side where the next tree row is to stand. At the point where the rings overlap, set a stake for a tree. Remove wire number one and set it on the third stake in the base line, stretch the two tight and set a tree stake. Repeat as often as necessary. In setting the third row of stakes, use the second as a base line, and so on.

PLANTING THE TREES

Too often but slight attention is given to this important piece of work. There is too frequently a disposi-

tion on the part of the person setting trees of any kind to do the work as rapidly as possible, without consideration for the future welfare of the trees. Few realize that time spent in careful, intelligent preparation of the soil and in setting the trees is time well spent, and well paid for in the after development of trunk and branch. Better a month spent in preparing the future home of the young tree than years of its life spent in an unequal struggle for existence. More than that, the tree may die outright, and a year must elapse before it can be replaced. It is generally stated that the pecan is a slow grower, and yet I have seen trees from twelve to fourteen years old which measured from thirty-five to fifty-seven inches in circumference at the base, while, under less favorable circumstances, others stood still for a period of six or seven years, or until they had accumulated sufficient energy to overcome the untoward conditions of their environments.

After setting a stake for each tree, the ground is ready for digging the holes and setting the trees. A planting-board, such as is shown in the accompanying illustration, should be provided. It is made of a piece of inch board, four or five inches wide and five feet long. The ends may be notched or holes may be bored in them. In the center of one side, a notch, one and a half inches deep, should be cut. Provide a large number of small wooden pins or sticks, about one foot long and well sharpened.

When ready to dig a hole, place the planting-board so that the notch in the side fits against the tree stake. Then place one of the small pins in each of the holes or notches at the ends of the board. Allow these to remain in the ground. Remove the board and the tree stake, and dig the hole.

The hole should preferably be dug just before setting



Planting board.

the tree. In some cases, however, it may be necessary to have all the holes dug in advance. Make them wide and deep, six or eight inches wider than the extended lateral roots and eight inches deeper than the length of the tap-root.

In setting the tree, place the planting board back on the pegs and place the tree at the right depth, against the notch in the side. It will then stand exactly where a stake stood, and, if the stakes were in line, the trees will be also, if they are kept perpendicular while the earth is being filled in. The earth should be packed close about the roots by hand, the tree being set no deeper than it stood in the nursery. To finish up, tread the earth firm and tight. Loosely planted trees will not live.

To start the trees off well, one pound to one pound and a half of good fertilizer, analyzing about six per cent. potash, five per cent. phosphoric acid, and four per cent. nitrogen, should be thoroughly mixed with the earth that is used in filling in the hole. Preferably, only surface soil should be used to place about the roots.

When the hole is filled in about three-fourths, water may be applied to advantage, particularly if the weather is dry. A good application should be given after the work is completed, so as to establish the capillary movement of the water in the soil.

The greatest care should be taken to prevent the roots from becoming dry; if they do, the chances of their living, after planting, are very greatly reduced.

From the time the trees are lifted from the nursery row until they are set in the orchard, the sun should never be allowed to shine on them. Neither should they be exposed to hot or drying winds. Should it happen that the trees are received before everything is ready for planting them, they should be unpacked and heeled-in in a shady place.

The roots of the trees must be pruned before plant-

ing, but this should be done under a shed. All broken parts of roots should be carefully cut off, leaving good, smooth surfaces, and the tap-root cut or pruned back, as described in the chapter on pruning. When the pruning is finished, *the trees should be wrapped in a damp blanket or in damp sacks and taken to the field.* When needed for planting, they should be removed one by one and set out.

CHAPTER VIII

CULTIVATION AND FERTILIZERS

As in the cultivation of many orchard fruits, there is difference of opinion on the subject of pecan cultivation. There are those who recommend sod or grass culture, and those who believe that clean culture for a portion of the growing season, at least, is the best and safest system to follow.

BENEFITS OF CULTIVATION

Cultivation is beneficial in the following ways: It increases the water-holding capacity of the soil and conserves moisture, both by allowing the rain water to sink more freely into it and by checking evaporation. It pulverizes the soil and allows the air to penetrate, thus supplying oxygen to the roots. It assists in setting free plant food, and makes the soil fine, thus enabling the roots to reach all parts of it. In cultivated soils, decomposition and nitrification go on much more readily, and if the materials are present from which nitrates can be made, their formation takes place much more rapidly than if the soil be left uncultivated.

Generally speaking, cultivation should begin a little in advance of the starting of growth in spring. If weeds are present, it is best to get them destroyed and out of the way in good season. Plowing should be done, in most cases, either when preparations for planting are being made in spring or the ground should be broken some time during the winter.

If the season is dry, then give cultivation just as

often as can be done. Every week or ten days, between the first of April and the first or middle of July, the ground should be stirred in young orchards. Shallow cultivation is all that is necessary after the first plowing. A weeder or light harrow will do the work. This shallow cultivation will preserve a dust mulch, a couple of inches or so in depth, and the loss of soil moisture by capillary action and evaporation will thereby be prevented; more moisture will be retained in the soil, and the trees will be benefited accordingly.

Whether the orchard is planted in a crop or not, cultivation should begin about the time growth starts in spring. The ground should be plowed and leveled with a cultivator. After that, frequent shallow cultivation should be given with a light harrow or weeder. Once every week or ten days, if the weather is dry, will result in much good to the trees. If a shower should fall during one of these dry periods, the ground should be cultivated just as soon as it can be worked. A light harrow, which will break up the surface crust formed by the rain and leave instead a shallow mulch of pulverized soil, will go a long way toward conserving and holding the water which has been added by the recent rainfall.

CULTIVATING OLD ORCHARDS

The cultivation of old orchards may vary somewhat from that given younger ones. Some recommend that the old orchard be seeded to grass (Bermuda or Johnson grass) and used as a pasture. This may answer in some cases, particularly on very rich, alluvial soils, but, in general, it will not do as a definite policy year in and year out. Those orchards planted in grass which the author has had an opportunity to examine have usually shown a large percentage of trees with branches dead at the tips, "stagheaded," with yellow leaves and a general appearance of unthriftiness. It



A well-cultivated pecan orchard.

may have been that these orchards were planted in grass while the trees were too young. The better treatment, and the safest method to follow in old orchards, is to cultivate the ground in spring and sow down in cow-peas or some other legume. Beggarweed, velvet beans or soja beans will answer well in many localities. Allow these to make what growth they will, and, when dead and dry, plow them back into the soil. It may seem strange to cultivate a forest tree, but it is the plan to follow to get results. Good results could doubtless be secured by seeding the pecan orchard in alfalfa and using it for a hog pasture up to the ripening season.

Cultivation should not be prolonged too late. If it be, the trees will continue to grow later than they should. Enough time will not be left in many sections before the coming of the first frosts. If the immature, sappy wood is caught by an early frost, severe injury may result. In the more southern extension of the pecan area cultivation can be carried on later than toward the northern limits of the region. Ordinarily, it is safest to cease cultivation not later than July the first to July the fifteenth.

TOOLS

The tools used in handling the cultivation of the orchard will have to be varied to suit the soil conditions. Under most conditions, a good plow, cutaway or disc harrow, and an acme harrow answer all purposes. As the branches of the trees spread out, almost or quite reaching the ground, the disc harrow and acme harrow should be provided with extensions, to allow them to be shoved apart for cultivating close up to the trunks of the trees.

FERTILIZERS

On deep, rich, alluvial soils the trees may not need to be fertilized; but many of the soils on which pecans

have been set in orchard form, require to be fertilized, to secure the best results. The three important plant foods required by plants and most frequently deficient in soils are nitrogen, phosphorus and potash. One or two, or all three, of these substances may have to be supplied.

Nitrogen, which is used by the trees largely in making growth of leaf and wood, may be supplied from a number of different sources, viz: stable manure, cotton seed, cotton-seed meal, dried blood, fish scrap, sulphate of ammonia and nitrate of soda. These substances are the principal commercial sources of nitrogen. Large amounts of nitrogen are gathered by leguminous crops: cowpeas, vetch, beggarweed, velvet beans, alfalfa and others, may be planted to advantage, resulting in a great saving in fertilizer bills, and, besides, adding the necessary vegetable matter and humus.

The most common source of phosphorus, usually referred to as phosphoric acid, is acid phosphate. Some is obtained from bone, and bone meal is a good fertilizer to use among pecan trees. The results obtained from its use are not immediate, but, since the bone does not decay rapidly, they extend over a considerable period. On the whole, acid phosphate is as satisfactory as any material as a source of phosphoric acid, and the goods with the highest percentage are usually the most economical in the end. A good grade is that analyzing fourteen per cent.

Potash may be purchased, as kainit, the raw salt, or as muriate of potash, low-grade sulphate of potash and high-grade sulphate of potash. Of these the sulphates are usually given the preference in fruit-growing. Of the domestic sources of potash, wood-ashes are important.

The amount of fertilizer which it is best to apply is difficult to decide upon; much depends on the character of the soil, what crops are cultivated, and whether a crop of legumes is grown or not.

If legumes are grown for the benefit of the orchard, they should be fertilized, and, if the crop is turned back into the soil, this may be sufficient for the trees, particularly while they are young. For the legumes, a good fertilizer to use per acre is:

Kainit, 100 lbs.; Acid Phosphate, 200 lbs.
or, High-Grade Sulphate of Potash, 50 lbs.
Acid Phosphate, 200 lbs.

In any case, some allowance should be made for the amount of nitrogen collected by the legumes. When corn, cotton or some other crops are grown in the orchard, fertilizing may simply consist in distributing an additional amount of the crop fertilizer for the benefit of the trees.

For the growth of the young trees, a larger amount of nitrogen and a relatively smaller amount of phosphoric acid and potash are required; while, for older trees, the reverse is true. Phosphoric acid and potash are required by bearing trees for the formation of fruit. Consequently, when the pecan orchard comes into bearing, these materials should be increased in the fertilizer applied. If the soil is not very rich at the time of planting, good results will follow the use of a pound of good commercial fertilizer at this time.

A good fertilizer for young trees should analyze five per cent. phosphoric acid, six per cent. potash, and four per cent. nitrogen. For bearing trees, one analyzing eight per cent. phosphoric acid, ten per cent. potash, and four per cent. nitrogen will give good results. If so desired, well-known brands of commercial fertilizers, having approximately the above analysis, can be purchased in the markets; but, if preferred, the several materials may be purchased separately, then mixed and applied.

Well-rotted stable manure may be used as a surface dressing to advantage. It should be applied preferably

during the winter months, not piled against the tree trunks, but spread over the ground at some distance back from them. It is well, to remember that stable manure is deficient in potash, and it is well on some soils to supplement the application of manure with potash in some form.

APPLYING FERTILIZERS

The roots of young trees do not extend to any great distance away from the trunk. In distributing the fertilizer, this fact should be remembered. A safe rule for all small-sized trees is to commence just outside an imaginary circle of two feet radius, and apply the fertilizer in a circular band extending out some distance beyond the spread of the branches. Old trees, or those having a considerable spread of top, when planted in orchard form, should be fertilized by broadcasting the fertilizer over the ground. In the northerly pecan sections, all the fertilizer should be given in one application, about the time growth starts in spring, and plowed in; while, farther south, two applications may be made, one at the time mentioned above, the other from the first to the middle of June.

It will be noted that young pecan trees in the lower South usually make two distinct growths. The first starts during April and the second during June. The time at which these growths begin may be taken as a guide for applying the fertilizer. It should be put on some time in advance of the starting of growth, to give time for it to become dissolved and in position for the roots to take it up. Bearing trees usually make but one growth, as their surplus food is taken up in developing the crop. The winter or late spring application of fertilizer given bearing trees should be for growth, and the second application for the benefit of the crop.

CHAPTER IX

COVER AND OTHER CROPS

Too many of our ideas of fruit culture are borrowed from the woods, from the trees in the pasture lands, and uncultivated places generally. As the pecan is a forest tree in many sections of the country, the inference is, that it needs no cultivation, no fertilizer,—in short, is amply able to take care of itself. So it is, but not able to yield, at the same time, the large crops of nuts that are the object of its being planted.

From the woods, there is one lesson which it would be well for every one to learn; a lesson, not of the trees, but of the soil, of the dense mass of mold, of partially decayed leaves, of vegetable matter, of humus that covers the forest floor. The soil in the pecan orchard needs humus, vegetable matter; so does the soil in any other kind of orchard, and, to obtain results, it must be provided.

Now, it is a well-known fact that a number of years must elapse before a pecan orchard will begin to give adequate returns for the time and care bestowed upon it and the money invested in it. During this period, if rightly handled, the ground may be made to produce something else than pecan trees, and that, too, without injury to them. But, in growing a crop in the orchard, bear in mind that the trees need, and are benefited by cultivation, and that fertilizer will make them grow.

The crops grown in the orchard may be divided into two classes: "Cover crops" and "Catch crops." Since these are grown with two different objects in view, it will be best to discuss them separately, though some of

the most important cover crops may be used as "catch crops," as well.

ADVANTAGES OF COVER CROPS

The cover crop is grown for the good of the trees, to add plant food to the soil, and to put it in better condition, that the orchard may be kept in healthy, vigorous growth. Generally, the cover crop occupies the ground for a portion of the season only, being in most cases allowed to grow from about the first of July until autumn, or until the nut crop is ready to harvest, as the case may be. In some locations, it is dangerous to leave a mass of dry grass, weeds or other plants in the pecan orchard during winter. The author has many times seen trees badly injured by fires, which damage could have been entirely obviated by cleaning up the ground in the fall. Besides this, the trees are less likely to winter-kill if the ground around them is clean during cold weather. If the grove is in bearing, the cover crop should be disposed of in advance of harvesting, to facilitate the gathering of the pecan crop.

In many sections of the South, where the ground is rolling, the lands are subject to great injury from washing, particularly during the summer months. The cover crop is an important factor in preventing this. It helps to hold the water, allowing it to sink more gradually into the soil, and the vegetation prevents it from carrying away the surface earth.

Two of the most necessary materials, in a pecan soil, are nitrogen (ammonia) and humus. If a leguminous crop is planted, the nitrogen content of the soil will be greatly increased, and, on most soils, to the great benefit of the trees. In fact, a leguminous crop can be used to supply all the nitrogen which the trees will require for a considerable number of years after planting. Humus is of great value, as it improves the texture of

the soil, helps to hold moisture, and, by making the soil capable of retaining more water, further assists in preventing washing.

The cover crop growing during the summer months has an influence in checking the growth of the trees by using the moisture and food in the soil. This is an important feature, as it is necessary to have the trees go into winter perfectly dormant and with the wood well hardened up, as a safeguard against the cold. As soon as the cover crop is turned into the soil and decayed, the plant food contained in it is available for the trees.

KINDS OF COVER CROPS

In the pecan area, a considerable number of cover crops may be grown. In some instances, it may be well to use rye as a winter cover crop; but we shall consider only the leguminous ones, the most important of which are cow-peas, beggar-weed, velvet beans, soja beans, crimson clover, hairy vetch, and bur clover. It is not to be understood, of course, that all of these can be grown, wherever pecans are grown, but a selection can be made from the above list.

The cow-pea may be grown throughout the whole region, while the velvet bean and beggar-weed are limited to the lower Gulf section. The crimson clover, hairy vetch and bur clover are winter cover crops, better adapted to more northerly sections.

The cow-pea is so well and favorably known that little need be said about it. Generally, on old lands, the Iron variety should be given preference, as it is not injured by root-knot. Beggar-weed is excellent in the region to which it is adapted, and, if carefully managed, it requires seeding but once. It will re-seed itself. It lends itself well to clean cultivation in spring, as a sufficient quantity of seed remains dormant during this period, to give a good stand after cultivation ceases,

about the middle of June or the first of July. Should the velvet bean be used, it must be carefully watched, to see that it does not climb into and over the trees and break them down. In its region, it is a splendid humus- and nitrogen-producing plant. All cover crops should be dead and dry before they are incorporated with the soil, to prevent making the land sour. If they are not in this condition at the time desired, they may be cut with a mowing-machine and, after drying on the surface for some days, plowed under.



Method of cultivating and growing a cover crop.

Sometimes a condition has to be met, brought about by there not being enough water in the soil for the best welfare of the trees, and the growth of the cover crop. Again, it is sometimes desired to continue cultivation, particularly of young trees, even after the time the cover crop should be given possession of the ground. The plan which the writer has usually followed in this latter case, and which can also be used in the former instance, is to cultivate a strip along each side of the rows of trees, and allow the cover crop to grow on the

remainder of the ground. This strip should have a total width of eight to twelve feet in the case of young trees, depending upon their size. Among older trees, or even in the case of younger ones, some of the cover crops mentioned, particularly the cow-peas and soja bean, may be sowed in drills, and these, cultivated from time to time with a cultivator, would give the trees a longer period of cultivation, if desired.

CATCH CROPS

Catch crops are sown in the pecan orchard, to have the ground produce an income in addition to growing trees. The crops which can be used to advantage in this way are some of those mentioned under cover crops,—but grown for the hay they will make,—truck crops of different kinds, corn and cotton. It is not good policy to continue the cultivation of corn and cotton in the orchard, year after year. They are clean-culture crops, and leave little behind them to make humus after they are removed. They should be rotated with the legumes. An excellent three-year rotation, for example, would be: first year, cotton; second year, corn; third year, corn and cow-peas. Cow-peas may be sown at the last working of the corn, and, in some sections, crimson clover or bur clover could be put in at the last working of the cotton crop. Truck crops may be followed with legumes the same season. With a little forethought and care on the part of the grower, a number of crop combinations can be worked out which will allow him to take something from the soil, and yet keep it in good condition for the trees. When cotton, corn or truck crops are planted, leave out a row or two where the tree row is, let the trees have feeding-space, but *cultivate all the ground*. If fertilizer is used in growing the catch crops, add a little for the trees. Labor must be carefully watched, as great injury may be done the

trees by careless cultivation. An awkward mule and a careless plow-hand may ruin more trees in a little while than would pay their wages for a year. Some one has said that we may continue to farm the pecan orchard just as though the *trees are not there*; but it is well to remember, and to have every laborer remember, too, that the trees *are there*.

DOUBLE PLANTINGS

There are some fruit trees which we may plant on a piece of ground, plant nothing else, cultivate the soil and give it up entirely to the orchard. But, in view of the time which must elapse between planting and bearing and the distance apart at which the trees must be set, the best plan for managing the pecan orchard, from the standpoint of the fruit-grower, is to make a double planting. We know that this plan, as applied to other fruit trees, has not met with unqualified success, yet we know, on the other hand, that it can be successfully done with the pecan. The difficulty usually is that the secondary trees, the "fillers," are left too long, to the injury of the permanent trees.

Holding in mind, then, that they may do injury to the pecan trees, and that we attach no value to the fillers when we see they are likely to injure the permanent part of the orchard, we are prepared to recommend the system of double planting. The fruits which may be used for inter-planting will depend upon the location and the character of the soil. Among those which we would suggest are: peaches, plums, figs, grapes, dewberries and strawberries. Utilizing the ground in this way, it may be used to good advantage. The product from the "fillers," if successfully managed, will more than pay for the expenses of the double planting of pecans and other fruits, the care and maintenance of the orchard, and leave a profit besides. It is

a plan which is being followed by a large number of planters, and we can recommend it to the careful consideration of the prospective pecan planter. At 40 feet apart, for instance, one filler can be placed between each two pecan trees, each way, with one filler in the center of the square formed by each four pecan trees. While it may not always be so, yet the author's general observation is that the fillers suffer from the inroads of the pecans rather than the pecans from the fillers.



Cotton growing in pecan orchard.



Twenty-year-old Frotscher pecan trees, branched at six feet.

CHAPTER X

PRUNING AND SURGERY

UP to date, no definite system has been worked out for pruning the pecan. The tree reaches such a large size that, except during the first fifteen or twenty years of its life, it does not lend itself readily to regular pruning treatment. Even during its initial period of growth, little appears necessary except to cut back a branch here and there, that the trees may develop well-rounded, symmetrical tops. All the dead or injured branches should be removed, and all wounds should be promptly and carefully treated. The natural life of the pecan tree covers a period of several hundred years, and, to have it live out its usual period of time, it is well to give it the most careful treatment. The germs of decay, entering through dead branches or exposed wounds, may subject it to further and increased injury from high winds and storms.

HIGH- VERSUS LOW-HEADED TREES

There has been much discussion as to the proper height at which the heads of pecan trees should be formed, and there appears to be no immediate danger of the controversy being ended. So long as all pecans are not grown by one person, so long will there be differences of opinion; and, covering this point, as well as many others, there are likely to be nearly as many opinions as growers. There are, of course, conditions which have to be met. Where trees are planted on lands subject to overflow, for instance, it may be best

to have the trees headed high, as low branches, in some cases, would be subject to injury.

In all lines of fruit-growing, the modern tendency, however, is toward low-headed trees, and that this style of tree has distinct advantages cannot be gainsaid. The principal argument advanced in favor of high-headed trees and accompanying bare, unshaded trunks is that this style of tree is necessary to allow of crops being grown under the trees, or because it is desired to use the ground as a cattle pasture. These considerations should not weigh against the welfare of the trees. As much ground can be cropped around low-headed trees as is good for them, and, in brief, the cows should be pastured elsewhere.

Frequently trees are so pruned that their first branches are eight or ten feet from the ground. Even young trees are pruned to slim stems, surmounted by a small, umbrella-like top. Such trees frequently have to be tied to a post to keep them upright until such time as they attain sufficient size to support themselves. Such pruning should not be countenanced. The trees will make a much more rapid and satisfactory growth, and their trunks will be less affected by the hot sun, if the branches are allowed to develop lower down. Diseases or insects attacking the trunks are much less likely to begin work in low-headed trees.

Ordinarily, the top of the tree should be so shaped that the lower branches will be four to six feet from the ground. The former distance is best adapted to those varieties which tend to develop their branches in an upright position, while those of spreading or somewhat drooping habit should be headed at six feet. A row of pecans headed at six feet is shown in the accompanying plate, and it will be noted that the branches touch the ground. By allowing the branches to form low down, the trunk will be shaded and protected, the crop will be nearer the ground, and the low tops will be less

subject to the destructive force of heavy winds, so injurious to both fruit and branches. If spraying has to be done on young trees, they are much more easily handled when the heads are low.

To start the trees at four or six feet, the tops must be cut back to that height at the time the trees are set, or, if smaller, when they have grown to that height. Four or five buds nearest the top should then be allowed to develop and form the main framework of the tree. After this the trees will need little or no pruning, except the cutting back of straggling branches, and the removal of dead or broken ones.

Some writers have advised the persistent and severe cutting back of the tops, from time to time, so as to keep them small, compact and low, but such a system of pruning must be put into practice on a considerable scale for a number of years before it can be recommended. Such a plan might prove useful where the trees are subject to the force of strong winds, but otherwise it is of doubtful value.

ROOT TRIMMING BEFORE PLANTING

Two-year-old tap-roots should be cut to eighteen or twenty-four inches; larger ones, in proportion. The old idea that transplanted pecan trees, the tap-roots of which have been cut back, will not live and bear, is not borne out by experience. They are in nowise injured by its partial removal, and it might all be removed were it not that so many would die in transplanting.

On page 94 are shown two pecan trees at two years. The one on the right was carefully lifted, so as to preserve as much as possible of the tap-root, while the one on the left had the tap-root cut when it was transplanted at one year. In the latter, six small roots from four and one-half to eight inches in length had grown out to replace the tap-root, these doubtless having supplied the

tree with as much nourishment as would have been collected by its single tap-root. If one tap-root is good, then, by the same rule, six should be better. Furthermore, without doubt, one of these roots would have grown so as to replace the tap-root.



Tap-root cut at one year. Tap-root not cut.

The advice has been given to cut the tap-roots back to five or six inches, but, under general average climatic conditions throughout the pecan region, any one who follows this advice will have reason to regret it. Our experience in transplanting pecan trees has been such as to indicate the necessity of having a well-branched, well-developed root system, and a tap-root, when present, should be left at least as long as already indicated. All broken and injured side roots should be pruned back, leaving good, smooth surfaces.

A long tap-root is objectionable on account of the additional cost and labor entailed in digging holes of sufficient depth for planting. To shorten the length of the tap-root, Mr. E. E. Risien, of San Saba, Tex., has patented a method which has given satisfactory results. The nuts from which the stocks are grown are planted over strips of mosquito-netting, the netting being some distance below the level of the nuts. When the tap-roots have penetrated to the netting, their growth is stopped, and the lateral roots develop better in consequence.

PRUNING TOPS OF YOUNG TREES

The practice of not pruning the tops of young pecan trees at the time they are set out has been quite gen-

erally followed. That it is the best plan is by no means certain, and it appears that better results are obtained by cutting back the tops of even the smaller sizes of pecans at the time they are planted. The top of the pecan bears the same relation to its roots that any other tree bears to its root-system, and the same rule applies. The greater portion of the pecan's roots are left in the ground when the tree is dug, and the top should, therefore, be cut back proportionately. Four-to five-foot trees should have about ten inches of their tops removed, and other sizes in proportion.

NURSERY ROOT-PRUNING

Too frequently, the root-system of pecan trees intended for planting is but poorly developed. The root consists almost entirely of one large tap-root, destitute of laterals. Such trees are slow in starting and are hard to transplant. A pecan tree should be almost as easily transplanted as an apple tree. A little more care on the part of nurserymen would insure good root-systems.

In a former publication it was suggested that the young seedlings intended for stocks be root-pruned "in the fall, after the trees are one year old. It could easily be accomplished by running the tree-digger down the row at a depth of nine or ten inches. The tap-roots could thus be severed, and the following spring, or summer, the trees could be worked (budded or grafted). This course of treatment would insure greater success in transplanting, as it would have a tendency to develop the lateral roots; and, in addition to that, it would, in all probability, induce earlier fruiting."

HOW TO MAKE THE CUTS

The sign of the careless or ignorant pruner is the presence of stubs four inches, six inches, or some

other length, in the top of the tree. All branches should be cut back close to the trunk or branch from which they start. If allowed to remain, the wound cannot heal over, the stub rots away, and the decay extends into the trunk of the tree. It has been amply



Rotten hole due to careless pruning.



Properly made wound ready for painting.

proven that wounds heal over much more readily and satisfactorily if the branches are cut back close. Avoid large wounds as much as possible, and especially on older trees, as they do not heal over readily.

WHEN TO PRUNE

There are two seasons better suited for pruning than almost any others,—during the winter dormant season, and in spring, after the leaves are fully developed and the crop has set. By many, the winter season is preferred, as there is more time to give to the work, and there is less danger of injury to the tree top, and no risk of injuring tender branches or the young crop of nuts. On the other hand, if pruning is done after the

trees are in leaf, dead branches are much more readily detected, and the wounds heal over very satisfactorily. Winter pruning generally promotes growth of new shoots, while, if pruning is done in early summer, the energy of the tree is directed into branches already formed, and may have a distinct effect on future crops. Pruning should not be done during the period of rapid sap movement, in spring, as the wounds become wet and cannot be painted satisfactorily.

TREATMENT OF WOUNDS

It is needless to say that all wounds made on branches or trunks should be protected. It is now generally conceded that white-lead paint, with enough lampblack added to make it about the color of the bark is the best covering to use. This precaution must not be neglected on wounds of any considerable size, else rotting of the exposed wood will take place, resulting in weakening the tree and shortening its life.

If the wood exposed by a wound has decayed and extended toward or



Cleaning a wound before filling with cement.

into the heart of the branch or trunk, it requires careful treatment. All the decayed wood must be cut away with chisel and mallet, until the last particle of it is removed. Paint the fresh wood surface with carbolineum, or some other good wood preservative. Then fill up the hole with cement, round it off so that it will not hold water, and cut around the edges of the wound with the knife, to help in healing it over.



Hastening healing of wound by cutting the callus.

Old wounds, and particularly those on old trunks or branches, are frequently slow in healing over. The first year, the amount of callus formed is quite large; but it takes several seasons to heal a large wound, and the callus formed each succeeding year is less than that made during the previous one. The bark becomes thicker, the sap has to travel further and the wound is consequently left uncovered for a number of years. The rapidity with which a wound will heal may be increased by supplying more food to the tree, or by

means of better general care and cultivation. But a little assistance can be given with the knife, used as shown in the accompanying illustration. The point of the blade should be inserted through the bark close to the inner edge of the callus and a cut made all around the wound. This will relieve the pressure of the bark, and the amount of callus formed will be greatly in excess of what it would otherwise be.

CROTCHED AND BROKEN TREES

In a pecan-tree top, a forked or crotched development of the branches is very objectionable. If the trees are regularly pruned, this can be prevented by removing one of the branches before it becomes too large. Strong winds very frequently break off one of the branches, resulting in a large wound on the trunk. It is a difficult type of wound to heal over, and the symmetry of the top is almost certain to be destroyed. The best plan is to bolt the two branches together to prevent their splitting apart. A half- or three-quarter inch hole should be bored through the branches two and a half or three feet above where they separate, using a long bit or auger. Place a good-sized washer over the hole, and drive in a bolt of the right size. Place another washer over the protruding end and screw on the nut. Paint the places where the bark has been injured. A piece of wire or chain should not be tied around crotched branches, as it cuts into the wood and interferes with normal growth. A branch may sometimes be bent over from one branch to another and inarched, to form a living brace.

Sometimes a branch is nearly split off and bends over until it rests on the earth. If promptly attended to, it may often be saved. Lift the branch back into place and tie it there with a stout rope. A block and tackle may be necessary, if the branch is large. Pro-

cure two bolts, and pass one through about five or six inches above the bottom of the split, the other two or three feet above this, and turn the nuts up tight, to bring the branch back to its original place. Remove the rope, paint the edges of the wound, and wrap the wounded part with burlap to prevent drying out. This burlap should be removed after a time. Usually the parts will make a good union if the injury receives prompt attention.



Preventing splitting by an iron bolt and a living brace.

PRUNING TOOLS

In pruning pecan, as well as other trees, the tool most commonly used throughout the country is an ax. We admit that the ax is useful; useful for making firewood; and, if that is what you wish to make of your trees, then by all means use it. But, in pruning, the ax is the tool which goes with knot-holes, decayed trees and neglect. It is the index of careless, ignorant methods. Leave it at the wood-pile, and provide a good pruning-

saw and a pair of shears for pruning work. Get the best.

The best saws for small branches are the pruning-saws generally sold under the names, California, Climax and Pacific Coast. They are made like an ordinary hack- or butcher-saw. The blade is placed on a swivel and can be turned at any angle, thus making it possible to remove branches from narrow angles or other awkward positions. When old blades are broken or worn out, they may be replaced at small cost. For heavier work, one of the ordinary pruning-saws with straight or curved blades is best.

Of pruning-shears, there is an endless variety, good, bad and indifferent. The J. A. Henckle shears are among the good ones, and the author has used them with much satisfaction.

For cutting back long straggling branches, a pair of tree-pruners, of the Waters' type, will be found very useful. These are provided with a handle, six, eight or ten feet long, and are very useful for removing branches otherwise out of reach.

CHAPTER XI

FUNGIOUS AND OTHER DISEASES

THE fungous diseases attacking the pecan have not been thoroughly investigated. Up to this time, however, they have not become so numerous or troublesome as to cause serious damage, except in a few instances. Those which have attracted most attention are the pecan leaf blight and the pecan scab. The former has been most noticeable on young pecan seedlings, and the latter has appeared here and there on nursery and other seedlings, and also on some budded sorts.

Fungous diseases are usually propagated and disseminated by means of spores, and the most effectual method of control generally consists in spraying with Bordeaux mixture, lime-sulphur, or some similar fungicide. For all fungous diseases of the pecan which may be controlled by spraying, no substances will give better results than those just mentioned. Directions for preparing them are given at the end of this chapter. To either of these, arsenate of lead or Paris green may be added for the destruction of biting insects.

The spraying of young pecan trees can be easily done. For effectual work in spraying somewhat larger trees, a platform may be erected on the wagon-bed, to make it possible to reach the higher branches with the spray. But the control of diseases by spraying is not feasible in the case of large trees, and methods of control by means of immune varieties, keeping the trees well cultivated and well fed, by cleaning up, and pruning out dead or injured parts, must be used.

PECAN LEAF BLIGHT (*Cercospora Halstedii*).—This disease of pecan leaves causes them to turn brown, wither up and drop prematurely. At first, small brown spots are noted. These become larger, and at length the whole leaf is destroyed. When attacked by this disease, the tree makes no progress. An examination of the discolored areas, under a microscope, shows the presence of tuft-like growths of spores upon short conidiophores. As they become matured, the spores are scattered by the rain or wind, and so the disease is spread. It probably lives over from one season to another on the diseased leaves.

As already stated, this disease is essentially a trouble found among nursery seedlings, and the author has not noted its doing serious damage elsewhere. After the trees are grafted or budded, they do not appear to be affected by it. The destruction of the leaves of the seedlings interferes seriously with their growth, and it is best to protect them against injury by spraying with Bordeaux mixture. The first application should be given just when the leaves are expanding, and, as each new set of leaves starts out, another application should be given. The 4-4-50 Bordeaux formula has been found very effective. A power-sprayer which will cover four rows at once is most economical, if large areas are to be sprayed. Sprayed seedlings will make practically double the growth of unsprayed.

PECAN SCAB.—This is a disease caused by a fungus (*Fusicladium effusum* Wint.) which attacks the immature nuts, leaves, twigs and branches. It first makes its appearance in the form of very small black specks or dots. Under a higher-power lens, these appear velvety and are found to be slightly elevated.

The number of black dots, each of which probably represents a starting point of the disease, is sometimes so great on the husk of a single diseased nut that it is impossible to count them. Later, they enlarge and

join one another, thus covering the whole surface. As the season advances, hard, diseased areas form on the husk. These crack open, showing light-brown colored cracks at first. The nuts fail to fill, and generally drop prematurely. Sometimes, however, they hang on the trees even into the following August and September.



Two healthy pecans in shucks on the left. Five pecans affected by scab on the right.

On affected trees sometimes the whole crop is destroyed, and in other cases only a certain percentage is injured.

On the leaves, the dark areas are irregular in shape and of considerable size, particularly when located on one of the veins. The petioles of the leaflets and the main petiole are also attacked, and eventually the whole leaf is destroyed, turns brown and drops off.

How the fungus is carried over from one season to another has not been determined definitely, but we

believe it exists through the winter in another state on the twigs, or on the old nuts, either on the tree or on the ground, or both, and on the old, dead leaves.

Thus far, the disease has been observed mostly upon seedling pecans, though a few budded and grafted varieties have been noted which are subject to it. Among these latter may be mentioned Georgia, and in the southeastern states, San Saba. Many trees show a well-marked resistance to the disease. Of four seedling trees standing in a row, which have been under observation for a number of years, only one was affected by scab, the others have never shown the least sign of it. For further information, see chapter on Top-Working. Frotscher, Curtis and Schley appear to be immune, though there are many others not subject to the disease.

In view of these facts, two lines of control are open—top-work to resistant varieties, or spray with fungicides. Unless a variety has some very special point of merit, or is exempt from the disease in some localities, it should be struck out of propagation lists, if severely attacked by the disease in any pecan-growing region.

When control by spraying is undertaken, the first application of lime-sulphur spray should be made before growth starts in spring. This should be followed by the second one of Bordeaux or lime-sulphur when the leaves are half grown, and a third application after the fruit has set. Where trees are badly affected, the only satisfactory thing to do is to top-work the affected ones with resistant sorts, spraying is not practicable.

PECAN ROSETTE.*—"The earliest symptoms are a peculiar crimping of the leaves at the ends of the branches. These leaves are smaller, with crimped margin, and, when held to the light, show light green or yellow streaks between the veins. The leaf tissue in

*Orton, W. A., proceedings second annual convention National Nut Growers' Association, 1903, p. 32. 1904.

these light-colored areas is thin and undeveloped, and often breaks away, leaving angular holes in the leaves. A tree usually shows the disease over the whole top at once, though sometimes only a single branch is affected at first. As the disease progresses, the foliage assumes a bunched appearance, due to the formation of tufts of leaves at the ends of the branches. This characteristic has led us to use the term "Rosette" as a name for the malady.

The next stage of the disease, which is observed the second year or later, is a dying-back of the branches from the tips. This is followed by the development of numerous small, lateral branches from adventitious buds. These are short, producing thick clusters of small, unhealthy leaves, sometimes reduced to mere skeletons, so that the rosetted appearance of the tree is intensified. This goes on from year to year. The growth of the tree is checked, and these abnormal branches are formed only to die back each year. Trees in the earliest stages of rosette have been observed to have light crops of nuts, but, when badly diseased, are barren and unsightly or worse. Rosette has been found in all ages, from nursery stock to trees forty feet high.

"The cause of the disease remains a mystery. No fungous or other parasite can be detected in the earliest stages. The appearance of the trees leads us to infer that the trouble is internal, due to some derangement of the nutritive or assimilative functions of the plant, but we are unable to correlate this with any corresponding external conditions. That is to say, so many cases have been observed on fertile soil, when cultivation, drainage and plant food had all been provided, that it is impossible to conclude that the disease could be due to starvation or to the lack of any single element in the soil, nor can it be due to over-feeding, since it occurs in light soils and in neglected orchards.

"It seems probable that it will be classed by the plant

pathologist with peach rosette, peach yellows, and related diseases, the causes of which still remain unknown after years of investigation. The indications are that it is contagious, though a complete demonstration of this point remains to be made; at any rate, it must be regarded with concern until more knowledge is available."

The best recommendation that can be made in regard to pecans affected by this disease is to dig them up and burn them.

BORDEAUX MIXTURE

Copper sulphate	5 pounds.
Lime (unslaked)	5 pounds.
Water	50 gallons.

Dissolve the copper sulphate in two gallons of water, place it in barrel No. 1 and add water to make twenty-five gallons. Slake the lime, reduce it to a very thin paste, place it in barrel No. 2 and add water to make twenty-five gallons. To mix the solutions of lime and copper sulphate, dip a bucketful from each barrel, and pour together into the barrel of the spray pump. *The two mixtures should flow together as they are poured into the barrel.* This is one of the secrets of making a first-class mixture. The best arrangement is to have the barrels, Nos. 1 and 2, elevated, and use a piece of rubber hose to run the liquids into the pump barrel.

If a large amount of spraying is to be done, a somewhat different policy should be pursued. Too much time would be taken up in preparing the ingredients in small quantities. Instead, large amounts of copper sulphate should be dissolved and large quantities of lime slaked beforehand. This may be done as follows:

In a fifty-gallon barrel place about forty gallons of water. Put one hundred pounds of copper sulphate in a sack and suspend it in the water. As soon as dissolved,

fill up to the fifty-gallon mark. When well stirred, each gallon will contain two pounds of copper sulphate. Each time some of the solution is dipped out, the height of the remaining portion should be marked on the inside of the barrel. Before taking more of the solution out of the barrel, any amount of water lost by evaporation should be made good by filling up to the mark last made.

As soon as procured, the lime should be slaked, placed in a barrel, and kept covered with an inch or two of water. In this way it can be kept indefinitely.

To prepare Bordeaux mixture from these stock solutions, dip out two and a half gallons of the copper-sulphate solution, place it in barrel No. 1, and dilute to twenty-five gallons. From the slaked lime take fifteen pounds, or thereabouts, to allow for the water it contained, reduce to a thin paste. place it in barrel No. 2, and add water to make twenty-five gallons. Pour the contents of barrels Nos. 1 and 2 together, as already directed.

Tests.—If free copper be present, severe injury may be done to the foliage or other tender parts of the plants. Sufficient lime should be added to neutralize it.

Dip out a small quantity into a porcelain saucer or shallow bowl, and, holding it on a level with the mouth, blow the breath gently into it. If the mixture is properly made, a thin pellicle, or scum, will begin to form on the surface. If this pellicle does not form, milk of lime must be added until it does.

Another test is to dip the blade of a clean knife into the mixture. If a thin film of copper forms on it after holding it there a minute or so, more lime must be added.

LIME-SULPHUR

Recently a mixture discovered by Prof. W. M. Scott, of the Department of Agriculture, has given most ex-

cellent results against apple scab and some other diseases; and this mixture, made from 10 pounds of sulphur and 10 pounds of fresh stone lime, to 50 gallons of water, will doubtless prove as effective against pecan scab and other pecan fungous diseases as it has against apple diseases.

Directions for its preparation are given by Mr. A. L. Quaintance, in the Yearbook of the Department of Agriculture for 1908. "Place the lime in a 50-gallon barrel, and pour 2 or 3 gallons of cold water over it. Immediately add the sulphur and 2 or 3 gallons more of cold water. The heat from the slaking lime will boil the mixture violently for several minutes. Some stirring is necessary, to prevent burning, and more water should be added if the mass gets too thick to stir; but the cooking is more effectual when the minimum quantity of water is used, usually from 6 to 8 gallons being required. When the boiling ceases, dilute with cold water to make 50 gallons, stir thoroughly and strain through a sieve of about 20 meshes to the inch, in order to take out coarse particles of lime, but all the sulphur should be carefully worked through."

GENERAL REMARKS

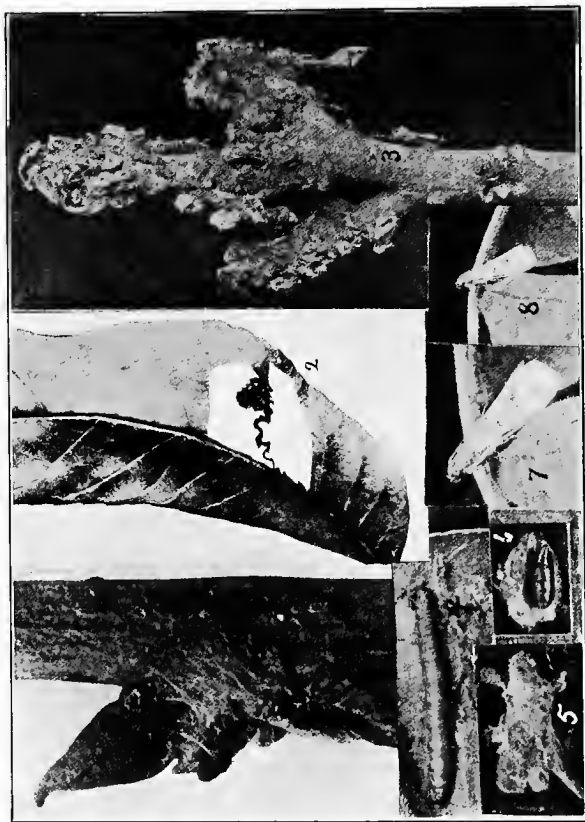
Use good materials and prepare the mixtures thoroughly.

In making up the various mixtures, never use iron vessels, but use glass, wood or crockery receptacles instead.

Strain all mixtures thoroughly into the spray-pump, to prevent clogging of the pump or nozzles.

Spray thoroughly and in good season. *Be in time.*

Do not use mixtures which have been left over and allowed to stand for some time.



The pecan bud-moth.

1. Winter stage on bud, enlarged.
2. Tube made on leaf, enlarged about twice.
3. Cocoon, enlarged.
4. Caterpillar, enlarged about twice.
5. Cocoon, enlarged.
6. Chrysalis, reduced.
7. Moth, enlarged.
8. Moth, about natural size.

CHAPTER XII

INSECTS ATTACKING THE PECAN

SOME time ago the statement was occasionally made that the pecan had no known enemies. This, to thinking and observing persons, was too good to be true, and fortunately the words, "no known," were inserted, for later investigations, particularly on the part of Profs. Gossard and Herrick, have revealed the fact that the pecan, in common with all other fruit trees, is subject to the attacks of insect and other enemies. But the outlook is hopeful, for we know of the abandonment of no fruit industry because of the attacks of insect pests, and the pecan industry is in no wise in danger of being abandoned because of their inroads.

FEEDING HABITS OF INSECTS

If an insect is to be successfully controlled, the grower must know something of its life-history, and particularly of its feeding habits. Careful observation of the insect, while at its work of destruction, will frequently give a clue to the method of control. Many insects, like the caterpillars of the pecan, bud-moth and case-worm, obtain their food by biting off pieces of the leaves or other parts of the tree and swallowing the solid particles. On the other hand, a number of insects, such as the scales and plant-lice, obtain their food by thrusting their small, bristle-like sucking tubes into the tissues of the leaves and sucking out the juices contained in the cells.

It is quite obvious that these two classes of insects

cannot be controlled or destroyed in the same way. Those which eat solid particles of food may, in most cases, be destroyed by applying some poisonous substance, such as arsenate of lead or Paris green, to the food which they eat. But those which obtain their food by sucking cannot be killed in this way. They can be destroyed, however, by spraying over their bodies some substance, such as kerosene emulsion, which will penetrate their bodies and so kill them. Or, they may be killed by suffocating them with a gas or by stopping up their breathing pores with some powdered substance, such as pyrethrum. Some insecticides, such as resin wash, act both as a caustic application and a suffocating covering. The spraying of pecan trees while they are young and of small size, even up to twenty feet or more, is entirely feasible; but the spraying of large trees is out of the question, because of the expense and labor involved, besides, it can not be thoroughly done, if undertaken. We must, in the case of old trees, depend upon sanitary precautions and insect parasites to control some insect enemies; and fortunately these insect parasites do gain the upper hand of some of the worst pecan enemies. Give them a chance.

For convenience in referring to insects which attack the pecan, we have grouped them as follows: (1) Insects attacking buds and leaves; (2) insects attacking the trunk and branches; (3) insects attacking the fruit.

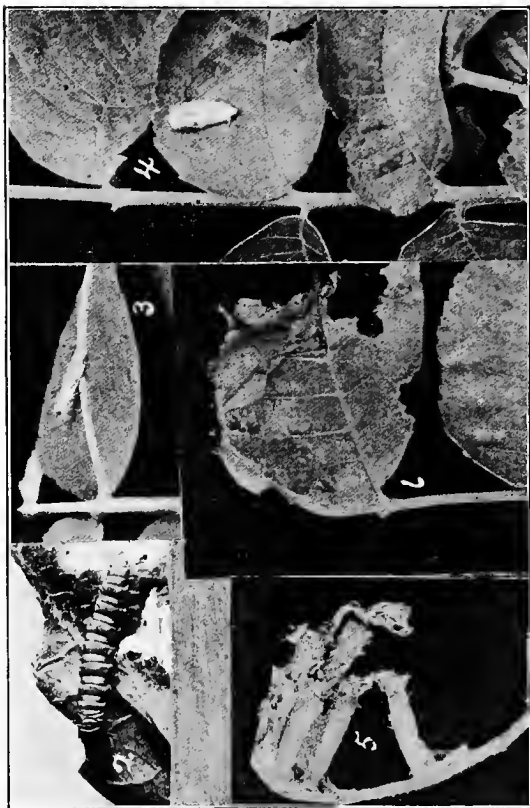
INSECTS ATTACKING BUDS AND LEAVES

THE BUD WORMS.—At least two species of caterpillars are known by this name. The moth of one has been called the bud-moth. The caterpillar of the other has been called the case worm. Professor Gossard writes that he unexpectedly found adult moths of *Proteopteryx deludana*, November 28th, 1905, and therefore believes, from this observation and other circumstantial evidence, that he was "mixed" regarding the autumn life-history of these insects, as set forth in bulletin 79 of the

Florida Experiment Station. He furnishes the following paragraph as a summary of what he can say of the bud worms:

"The Bud Moth, *Proteopteryx deludana*, is a serious pest, especially in young orchards. Sometimes, in such orchards, even when large, scarcely a tree can be found during the month of May that does not contain one or several nests. The caterpillars are usually found singly, each with one side of a leaf folded over it and fastened to form a tube, or sometimes two leaves are fastened together with silken bonds and the caterpillar feeds between them. As fast as the leaves it has attacked become brown and die, it draws fresh leaves to the dead ones and fastens them there, thus gradually making a very conspicuous nest. The caterpillar is full-grown during the last of May and the first of June, when they transform into moths. Their pupæ cases are formed of silk and excrement, smoothly lined with silk and snugly hidden away in a nest of leaves. In about two weeks from the time of pupation, the moths appear. Early specimens have sometimes been hatched from buds, only partially expanded. They are small, about five-sixteenths of an inch in length and five-eighths of an inch across the expanded wings. In general color they are grayish, streaked and dotted with blackish-brown. A characteristic habit is to alight and rest on the tree trunk, head downward. The moths have again been observed in November, suggesting that there are two broods a year. Thorough, persistent spraying with arsenate of lead or Paris green, in April and May, ought to control this species."

THE CASE WORM (*Acrobasis nebulella*).—This insect, often found associated with the bud-moth, probably does more damage than any other pecan insect. The caterpillars are about five-eighths of an inch in length, a dirty brownish green in color, and live in silk-lined cases or tubes attached to the petioles of the leaves. From these they protrude themselves to feed. Frequently a pair of leaflets are tied together, and between these the caterpillars live and feed upon the tips of the protecting leaflets. Opening buds, partially developed and full-grown leaves, alike are destroyed. Earlier in the season, characteristic nests of partially eaten leaves, petioles and excrement, are formed by several caterpillars tying the mass together with silk. In this nest they live and develop. The caterpillars pupate within their silken tubes, and the small gray moths (five-eighths to three-fourths of an inch in length) emerge about two weeks after pupation, chiefly in June. The small, hibernating "cocoons" found on and around the buds in winter, and the tortuous tubes observed on the leaves in summer and fall, which have been referred to (*Proteopteryx deludana*), probably belong to this species. At least, caterpillars, one-fourth grown, and contained in cocoons



The case worm.

2. Caterpillar enlarged. 3, 4. Moths, nearly natural size. 5. Cases. 6. Work on leaves.

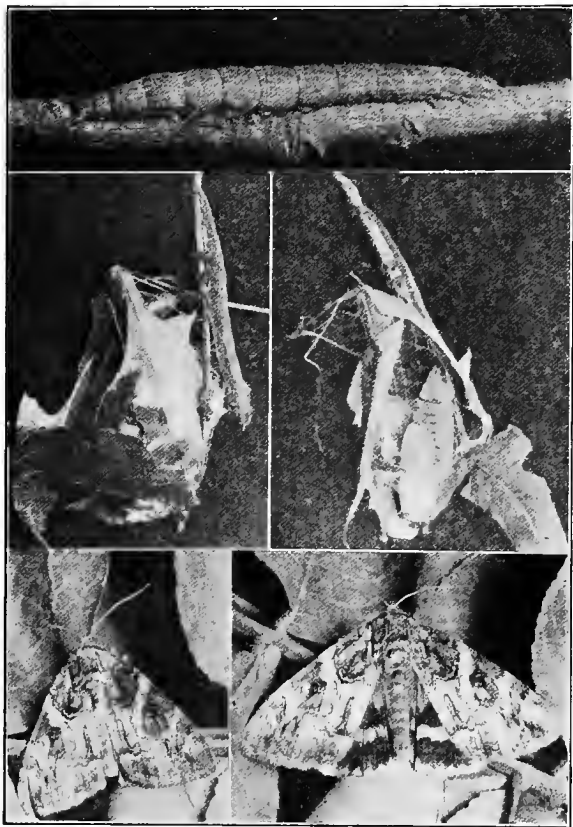
apparently not essentially different from the smaller ones, contain worms having the characteristic appearance of the grown *Acrobasis*. Spraying with arsenicals in April, May and June should destroy this pest. Spraying in late July and August would also promise results of value.

The bud and case worms can be handled economically on small trees by hand-picking. Both these species do harm, mostly to young trees.

THE CATOCALAS (*Catocala piatrix* and *C. viduata*).—The caterpillars of these insects are frequently found during April, May and June feeding upon the leaves of the pecan. They are ravenous feeders, and, if present in sufficient numbers, considerable damage is done. The caterpillars are from two to two and a half or three inches in length when fully extended, gray and striped, leathery in appearance, very closely resembling the bark of the tree upon which they rest when not feeding. Having attained its full growth as a caterpillar, it ties together two or three leaves with strands of silk, thus making a loose cocoon within which it pupates. The pupa is dark brown, covered with a whitish or bluish-white bloom. In about one month the moths emerge. They are large in size, the body being one to one and one-fourth inches long and the expanded wings two and one-half to three inches across. When at rest, they are a dull gray in color, more or less marked with irregular waving lines. The hind- or under-wings are strikingly different from the fore-wings. In *C. piatrix* they are deep orange-yellow, marked from side to side with two black bands. The hind-wings of *C. viduata* are dark brown and edged with a narrow white band.

The caterpillars may be destroyed by spraying with some one of the arsenical poisons, or they may be removed by hand and destroyed. Prof. Gossard recommends the tying of a piece of burlap around the trees. Beneath this the caterpillars hide during the night, and they may then be destroyed.

THE FALL WEB-WORM (*Hyphantria cunea*).—The caterpillars of this insect begin work early in spring, shortly after the leaves are full grown. They work in colonies, and the leaves on which they feed are enclosed in a web, which is extended as the caterpillars grow or as they require additional leaves to feed upon. When full grown, the caterpillars measure about one inch in length, and are covered with hairs both long and short. The matured caterpillars leave the webs and crawl down the trees, to hunt for places beneath the bark, under sticks, weeds and trash, in which to pupate. A light, flimsy cocoon, composed of silk and the hairs of the larva, is made. From this, in due time, a beautiful moth, an inch and a quarter across the wings, emerges. The wings are pure white or white spotted with black or brownish-

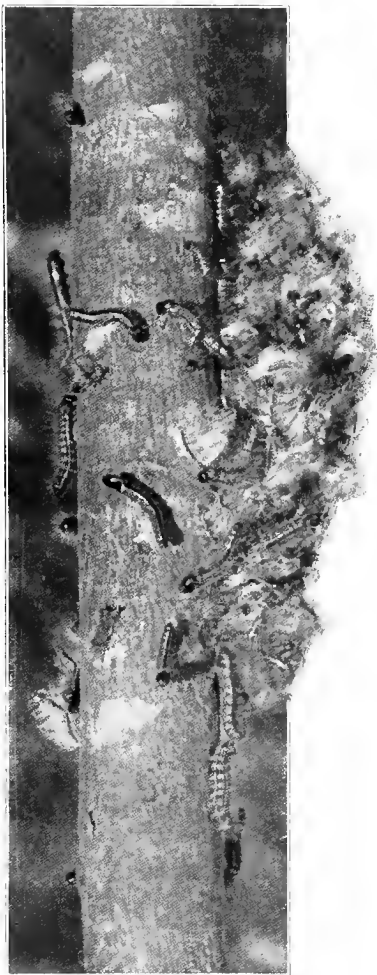


A pecan catocala (*C. piatrix*.)
Caterpillar, cocoon, chrysalis and moths about one-half natural size.

black. The eggs are laid in masses of four or five hundred on the leaves. These hatch in about ten days, and the colonies of young caterpillars begin their work of destruction. There are two broods in the South each summer; the first appearing in May and June, the second in August and September. The fall brood hibernates in the pupa state.

The caterpillars may be destroyed on small trees by removing the webs and killing the larvæ. On large trees, a torch of some sort may be used to burn the web and the caterpillars within it. They may be also held in check by applying a spray of Paris green or arsenate of lead at the time the broods are feeding.

THE PECAN CATERPILLAR (*Datana integerrima*).—A buff-colored moth, having a body about one-half inch long and a wing expanse of one and three-fourths inches, with four transverse brown stripes on the front wings, lays its greenish or white eggs in clusters of five hundred to twelve hundred on the underside of the lower leaves of the pecan trees. These eggs hatch in less than a week, and the colonies of young caterpillars at first feed upon the under sides of the leaves. They cast their skins four times, each time increasing in size and changing their color somewhat. The last molt,



Pecan *Datanas*.

and sometimes the last two, take place on the trunk of the tree, and the clusters of discarded skins frequently remain for several months afterward. After the last molt, they ascend the trees, remain feeding for a short while, then go down to the ground to pupate. When disturbed, the larvæ raise both ends of their bodies from the twigs or leaves, on which they rest. They are easily recognized by this habit. When full grown, they are one and one-half to one and three-quarters of an inch in length, covered with dirty white hair, and marked with two conspicuous longitudinal white lines, one on each side of the body. There are two broods, the last one hibernating in the ground in the pupa state.

The leaves on which the eggs are laid may be gathered and destroyed, or the colonies of young caterpillars may be gathered and burned. Later they may be burned off with a torch, killed when clustered on the trunk during the last molt, or poisoned with an arsenical spray.

INSECTS ATTACKING THE TRUNK AND BRANCHES

THE TWIG GIRDLEERS (*Oncideres cingulatus* and *O. texana*).—These two insects frequently do considerable damage to pecan trees in late summer by cutting off the smaller branches. Branches from one-fourth to three-fourths of an inch are usually the ones attacked. The insect is a beetle, and the two species closely resemble each other. They are dark gray in color, one-half to five-eighths inch in length, with antennæ longer than the body. They are provided with stout, powerful mandibles. The female insect cuts the branch by working round and round it until it is almost entirely severed. She then lays a number of eggs in it, usually one or two being placed near each bud. A small cut is made and the egg is inserted between the bark and the wood, and the opening is then sealed up with a gummy substance. As the insect moves along the twig, series of transverse cuts are made in the bark. The twigs usually drop to the ground. The eggs hatch as soon as the weather becomes sufficiently warm in spring, and the larvæ feed in the twigs, making tunnels through them as they grow. Later, they pupate within the tunnels, and emerge during August and September as fully developed insects, having spent one year in their growth from egg to mature insect. It is believed that, in some cases, the life cycle lasts two years.

The best and most effective treatment is to gather and burn all the twigs which have been cut from the trees. This should be done, preferably late in the autumn after the leaves have fallen, as there is greater certainty of getting all the severed twigs than if left until a later date.

THE OAK PRUNER (*Elaphidion villosum*).—Sometimes* pecan twigs, when smartly bent, will snap off with a clean, square cut across the branches, as if they were hollow-glass tubes, breaking at cracked or weakened places. An examination of such a broken stem shows "that its woody part, with the exception of a few fibers and the bark, has been cut across as if with a saw by a soft, yellowish-white grub, which can often be found in a burrow in the severed part. Since the uncut bark is the chief support left for the branch, any stiff wind, or even its own weight, will break it off as soon as it has become deadened.

"The adult is a longicorn beetle, of slender, cylindrical form, over one-half inch in length and about one-eighth of an inch in



Eggs and punctures of twig girdler.

width. It is of a dull, black color, tinged with brown on the wing-covers, especially toward their tips. The underside of the body and legs are chestnut colored. Over all parts of the body can be found short, grayish hairs. Some small gray spots on the wing-covers and a whitish dot on each side of the thorax are formed by dense collections of gray hairs at these points. Coarse, round punctures are thickly sprinkled over the upper surface of the thorax and wing-covers.

"The larva, when grown, is about three-fifths of an inch long, tapering backward from the neck. The body is divided by deep grooves into twelve rings or segments. There are three pairs of feet. The color is yellowish white, the front of the head being blackish. Probably, about midsummer, with a possible variation of two months in each direction from this date, the parent beetle deposits her eggs, preferably on a small twig of the preceding year's growth. Upon hatching, the young larva commences to

*Gossard.

eat the tender wood just beneath the bark, and then later enters the center of the twig and works toward its base. In this manner it works its way into the main limb, which may be of considerable size, and feeds within it for a period of about three years. The burrow thus becomes several inches in length, in many cases. Just before transforming to pupæ, some, but not all, of the larvæ, cut the wood for the purpose of dropping the branches, as before described. Limbs in which the immature larvæ are working often break off with ragged end, when bent with the hand.

" . . . Pick up and burn all fallen branches. Similar attention should be given nearby oak and hickory limbs which have fallen."

THE PECAN TREE BORER (*Sesia scitula*).—The moth of this insect is clear-winged and closely resembles the moth of the peach-tree borer. Little is known of its life-history.

"It is probable that the eggs are deposited by the female moth on the bark of a tree near a fresh wound; for example, near newly set buds. The eggs hatch and the larvæ bore into the bark, and there live for a time, eating out the soft inner bark and tender wood. It is certain that the borers live in these situations over the winter, and change to pupæ in the spring, from which the moths emerge in April. The moths I reared appeared April 3d, 4th and 6th. The pupæ are in cocoons, just under the bark. The cocoons are made from excrement and bits of bark that have been fastened together with silk similar to the cocoons of the peach-tree borer. Whether these moths, that emerge in the spring, lay eggs and produce a brood in the summer, that in turn develops a fall brood of larvæ, I am unable to say."

"The young borer is apt to gain entrance to the sapwood through some wound in the bark, such as graft-union, and here it feeds, sometimes completely girdling the sapwood above and below the wound. It is said to prefer to attack buds that have been budded on old, large trees. As a general rule, the burrows ascend the tree in a spiral about the trunk, so, complete girdling is unusual, but growth sometimes ceases above the groove, new limbs being shot out from below."

The only satisfactory means of controlling this pest is to go carefully over the tree and dig out the borers. The trees should be examined from time to time, in order to keep them free from borers.

INSECTS ATTACKING THE FRUIT

THE PECAN WEEVIL (*Balaninus caryæ*).—In some localities, considerable damage has been caused by the pecan weevil. The insect is a small, brownish-black snout beetle, somewhat less than

*Hedrick. (See index of literature.)

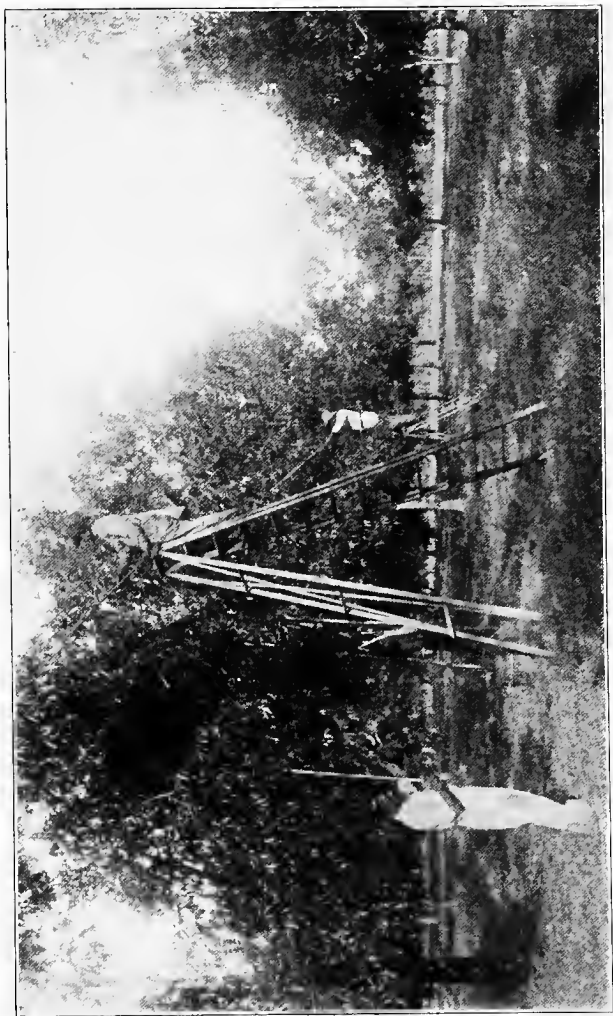
†Gossard. (See index of literature.)

one-half inch in length. The proboscis, or snout, is slender and as long as the body. With this proboscis the beetle bores a very small hole through the husk and shell of the immature pecan to the kernel, and at the bottom deposits an egg. This egg hatches into a larvæ, which feeds upon the kernel of the nut. In autumn the larvæ, when full grown, bore holes through the shells of the pecan and enter the ground, in which they pass the winter. The next season, they emerge from the earth as fully matured insects, and about the month of August deposit their eggs in the nuts.

After the harvesting of the crop, the hogs should be allowed to feed under trees in which the weevil is present, so as to devour any infested nuts which may have been left on the the ground. Poultry may also be of assistance in destroying the insects after they have entered the ground to pupate. It is probable that the larvæ in the nuts may be destroyed by fumigating with carbon bi-sulphide. The nuts should be placed in a tight box, and one-half pound for each five hundred cubic feet of space used, allowing them to remain for forty-eight hours.

THE HICKORY-SHUCK WORM (*Grapholitha caryana*).—Sometimes pecan nuts are attacked, as they approach maturity, by a small white caterpillar, which mines its way through the shucks of the nuts. This caterpillar is the hickory-shuck worm, the larvæ of a small moth.

But little is known of its life-history, and, until more is known of its habits, the best advice that can be given is to gather and destroy the infested nuts by burning them.



CHAPTER XIII

HARVESTING AND MARKETING THE CROP

WHILE, in preparing a crop of pecan nuts for market, such extreme care need not be exercised as in handling a crop of peaches, plums or oranges, still there are a number of details which require careful attention, to secure the best results. Careful attention to these few points is quite as necessary as in handling any other fruit crop, though it might appear otherwise.

PICKING EQUIPMENT

The necessary equipment for handling the crop is neither great nor expensive. Good, high step-ladders should be provided. These should be of the three-legged type, as they stand firm and solid on uneven ground much better than those with four legs. Other light, strong ladders of different lengths should be on hand, and among these one or two extension ladders, such as are used by painters, well-made and of good length. A number of bamboo poles, for getting at inaccessible nut clusters, are necessary. Hooks for drawing in branches to the picker, made of light poles about six feet long, with a small iron hook in one end, are very convenient. Picking-sacks of good stout duck are best for working in the tree tops, as they do not upset, and can be carried about, at the same time giving the picker free use of of both hands. Strong wicker-work or split-wood baskets, holding a bushel or two, are excellent for handling the crop from the orchard to the curing-room.

TIME TO GATHER

As a rule, the bulk of the nut crop must be disposed of before Thanksgiving, and there is, in consequence, a strong disposition to gather the crop anyway, whether ready or not. Much might be said on both sides of the question, but, in general, it must be granted that gathering the crop while still somewhat immature, and beating the trees to cause the nuts to drop, cannot be commended.

When the great majority of nut husks are open, the



A nut picker at work

crop of the tree is ready to be harvested and should be picked clean at one picking. It will not do to wait until every bur is open (some varieties never open, but such are extremely undesirable), for it will usually be found that by far the most of those which do not open on trees which open their burs uniformly are faulty, and it will not pay to wait for them. Neither should such be left on the tree, but the whole

tree should be stripped at the time already indicated. If the closed burs open during curing, well and good; if not, it is best to place them with the culls, as they are likely to be faulty.



Ready to be harvested

PICKING

The nuts must either be picked by hand or knocked off the trees onto the ground with sticks. From whatever standpoint we may regard the gathering of the crops, in orchards of good varieties, the best plan for the removal of the nuts is to take them off, in so far as possible, by hand. Men should climb the trees and collect the nuts in sacks. Men provided with sacks can, with the help of a good extension ladder, and the hooks already mentioned, reach most of the nuts on ordinary trees, up to forty or fifty feet in height. A good man will pick one hundred pounds of the shelled nuts in a day, at a cost of a dollar or a dollar and a quarter a day,—or one to one and a quarter cents per pound.

But why not have the men climb the trees and knock down the nuts, either by shaking the trees or by beat-

ing the clusters with the bamboo poles? Nuts otherwise out of reach have to be beaten off with poles, and very large trees have to be handled in this way; but where the practice of hand-picking can be followed, it is best to do so. When the nuts are beaten or shaken down, they are scattered in every direction under adjoining trees (perhaps of other varieties, and sorting is complicated), and often so far away that they are not immediately, and perhaps never, recovered. It does not take many lost dessert nuts to pay for the difference between the two methods of gathering, if there is any. Greater damage is done to the limbs and twigs than if the crop is hand-picked. Of course, when the trees reach very large size, other methods must be adopted.

In gathering the crop, the product of each individual tree, in the case of heavy-bearing seedlings, or of each group of trees of a single variety of grafted trees, should be kept in a single pile or lot. It will not do to mix nuts of different sizes, shapes and colors, if the best price is to be hoped for.

Following the picking, the broken twigs, branches and leaves should be carefully gathered and burned. Even where the best of care is exercised, there will be some debris on the ground.

SHUCKING

As soon as the nuts are carried to the curing- and packing-house, the shucks should be removed. Even when the shucks open well, many of the nuts will still remain attached by the inner membranes, and must be removed from their partly opened coverings. This work, at the present time, is done by hand; but doubtless, before long, machinery will be introduced to handle it. In the course of shucking, the unopened burs should be placed by themselves. If they open readily after a little drying, the nuts are probably good;



but, if they do not, it is safest, in the interest of a high-grade product, to discard them. If there is any doubt about them, throw them out.

The shucks, if no insects are present among them, may be scattered around the trees, but if they are infested with shuck worms, it is best to burn them and return their ashes to the soil.

Shucking costs about fifty cents per hundred pounds of nuts removed from the husks.

CURING

As soon as the nuts have been separated from the hulls, they should be spread out in shallow trays for curing. These trays should be two and one-half or



A corner in the curing-room.

three feet wide and four or five inches deep. The bottoms are best covered with wire netting, with meshes about one-half inch square. They may be arranged around the walls of the curing-room, one tier above

another. The room should be provided with good ventilation, so as to give a free circulation of air. In the trays the nuts may be placed two or three layers deep; if placed too deep, there is danger of their molding. They should be turned over from time to time, and, under average conditions, two weeks will be sufficient to cure them thoroughly. To further facilitate the curing process, the trays may be lifted from their racks and carried into the open air during the day and returned to the house at night. Curing is sometimes satisfactorily done by spreading the nuts on canvas sheets on the ground. Needless to say, they should not be exposed to rain or dew.

The curing-house should be absolutely rat-proof, well-lighted, and should afford ample space for handling the crop.

GRADING

Before packing for market, the nuts should be carefully graded. Too much attention cannot be given to this detail. Rigid grading pays—it pays handsomely, and, the more abundant the supply, the better it pays. All culls and small, imperfect or broken specimens should be thrown out.

It will not do to mix together nuts of all sizes, shapes, and colors—some small, some large, some pointed, some blunt, some dark, some light, some streaked, and then expect to get the full value of the crop. It cannot be done with a good grade of pecans.

Perhaps in no kind of fruit which is placed on the market can a more nearly absolutely uniform grade be made (see Frontispiece). The variety should be the basis of the grade. In gathering the crop, each variety should be put by itself as it is gathered. In most varieties the size is quite uniform, and little else need be done; but if there is any considerable variation in size, the small ones should be removed from the first

grade of nuts either by hand-picking or by screening through suitable screens.

Polishing and staining should not be done. It is always best to let each variety retain its own individual marks and characteristics. These are a part of the market quality of the variety and should, by all means, be retained. Mixed lots of seedling nuts may be polished to render them more uniform, but the staining is an abomination, though some people would rather have it, not knowing, perhaps, what a pecan looks like without it.

PACKAGES

The packages used for marketing pecans should be light, strong and attractive. The right sort of package goes a long way in securing satisfactory returns for its contents, and, in handling so valuable a product as the pecan crop, no pains should be spared in putting up a package that will meet the approval of the consumer. We are, at the present time, a long way from any sort of standardized package for pecan nuts, but something of this sort must eventually be worked out.

Pecan nuts have been shipped, from time to time, through the mails, or by express and by freight, packed in sacks, and when they reached their destination a portion of the contents was missing. We have the utmost sympathy with human weaknesses and no one was to blame but the shipper, who should have lost all he forwarded for not knowing better. Barrels for larger shipments, and wooden boxes for smaller lots, are the best and most satisfactory packages, and afford the necessary protection.

Gift packages should be neatly made. The smaller sizes may be made of half-inch planed lumber throughout,—the medium sizes of half-inch sides and three-quarter-inch ends, and the larger sizes with inch ends. They should be made well, and well nailed or mortised



A barrel of Van Deman pecans.

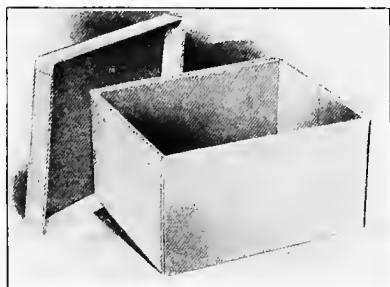


Gift packages, Teche pecans.

together. Roughly speaking, a pound of nuts well cured and shipped shortly after harvesting can be packed in about sixty cubic inches. If the nuts have been kept for a considerable length of time, they may require more space. The following box dimensions, inside measurements, are close approximations:

5 pounds.....	10 x 6 x 5 inches
10 pounds.....	10 x 12 x 5 inches
15 pounds.....	15 x 12 x 5 inches
20 pounds.....	15 x 8 x 10 inches
25 pounds.....	15 x 10 x 10 inches
30 pounds.....	15 x 12 x 10 inches
40 pounds.....	16 x 15 x 10 inches

In making up boxes for special varieties, it is best to make a test before making up the boxes in quantity. If any variation is made, it should be on the side of making them a little larger, as the space not filled with nuts can be filled with a piece of cardboard or a paper pad, to prevent shaking. It is, however, best that the



Corrugated paper box for gift package.

package should appear full when opened up. The weight of pecan nuts varies considerably. For instance, Randall weighs 41 pounds per bushel, while Van Deman and Teche weigh 40 pounds per bushel, 2150.4 cubic inches.

To add to the neatness of the package, it should be lined with paper, and the smaller sizes may be wrapped in paper before shipment. If the boxes are stained brown or light green, using one of the ordinary shingle stains, it will add much to their appearance.

For mail shipments, a corrugated pasteboard box may be used. Such a box, to hold three pounds of nuts, should measure inside about 5 x 6 x 6 inches, and, when made up and wrapped for shipment, will weigh a little less than the regulation four pounds. In handling the smaller lots of nuts, five, ten, or fifteen pounds, these same pasteboard boxes, made in proper sizes, could be used.

The package should be neatly marked, outside, with the grower's name and address, the name of the variety, and the number of pounds. A neat card may be enclosed, placed on top of the nuts, as an additional advertising feature.

PACKING

The packing of pecans is not a difficult task, yet, like every other operation, it requires its share of careful attention. The box packages for the individual trade should be neatly lined with paper. Carefully weigh the package and place in it the exact number of pounds it is to contain. Place the box on a solid foundation, shake down thoroughly, fold over the lining paper, place the cover in position and nail down. If the package is designed for display in the market, the cover should not be so tightly nailed down that the box must be broken or injured to show its contents; at the same time, it should be securely enough fastened to protect the nuts.

STORING

There is a mistaken idea, that, unlike fruits, the pecan can be kept indefinitely under ordinary conditions, and still retain its edible quality. So far as rotting is concerned, this is true, but heat and light work havoc with the quality of the kernel.

During the cold weather following the gathering of the crop, little or no change takes place in the flavor of the kernels. During the heat of summer, however, they deteriorate. The natural amount of moisture in them is reduced, the air enters, oxidation takes place and the flavor becomes rancid.

These changes can be prevented if the nuts are kept in cold storage, say, at a temperature of from thirty-five to forty degrees. When nuts are kept in the house, they should be stored in the coolest possible place, in sealed jars or tight boxes.

MARKETING

The Private Trade.—As it is at present, so will it be for many years to come,—strictly first-class pecans will be handled almost entirely by or through a private trade. We know of several growers who dispose of their crops of several thousand pounds annually to private customers, who have learned the value of good nuts. So greatly has the demand increased that, in no single instance, is any one of these men able to supply the demand—the natural outgrowth of his own work,—and orders are usually booked a year or more in advance. This is the ideal method of handling the crop, and the one method which enables the grower to secure the best price for his product.

In building up such a private trade, advertising must be resorted to, either through the newspapers, magazines and other channels, or by distributing samples of nuts. “Once a customer, always a customer” should be the motto for the grower to hold in mind, and every effort should be made and every precaution taken to see that the nuts, from year to year, are absolutely uniform in size, shape, and quality. Do not send a customer one size, shape, or quality one year, at a certain price, and the next year vary it. Such treatment will tend to

make customers dissatisfied, and the grower may lose them entirely, This point cannot be too strongly emphasized.

A good, liberal price should be fixed for the product, different sizes or varieties at different prices, and these prices should not be varied. In case of a short crop, it is best to pro-rate the output, giving each private customer a portion of what he desires, thus holding the trade from year to year.

High-Class Grocery Trade.—Strictly first-class nuts may be disposed of to advantage to the first-class grocery or fruit trade in the larger cities. In cities of any considerable size, there will always be found a grocer or fruiter who is willing to take a first-class article at a price considerably above the usual market price of ordinary nuts. Some years ago, the writer submitted samples of nuts of medium, but uniform size, and good quality, to a grocery firm in New York. They replied that they would take nuts like the samples at twelve and a half to fifteen cents a pound, in carload lots, when the common run of pecans could be purchased at four or five cents per pound. This difference in market value still exists, and, as the common nuts have risen in price, so has the price of the better grades risen. Ten years ago, ordinary seedling nuts could be purchased at from three to five cents per pound. Now, the price at wholesale has risen to fourteen and sixteen cents per pound, with no immediate possibility of lower prices prevailing. This has been brought about by the natural increase in demand, owing to the greater variety of uses to which the nuts are put and to larger consumption, and not by any market combination made to force the prices up.

Selling on Commission.—It may be advantageous, at times, to handle the pecan crop through a commission-merchant. The plan has its advantages and disadvantages; and, until the pecan output of the country, from

cultivated orchards, is in the hands of good growers and at the same time, good business men, it will be necessary to use the commission-merchant. We hear much about the dishonest commission-merchant; we hear less about the dishonest or ignorant and careless shipper. An honest commission-merchant and an honest shipper make a good and satisfactory combination,—one hard to find at times, but, when found, it works well in the interest of both parties.

If the crop is to be marketed through the commission-merchant, his honesty, integrity and financial standing should be carefully ascertained. Rightly so, for the crop is entrusted to his care, with these as the sole guarantee of honest returns. Don't split the shipments in one town or city. Let one merchant handle your output for that city. Work with your commission-merchant. Your interest, if he is of the right sort, is his interest. Ship him in the quantities he can handle, and send him the product when he wants it. He is on the ground, and knows the market conditions better than you do.

Remember, too, that it takes some time to build up a trade in any center. It is an excellent plan to begin in a small way in a market, and gradually increase the shipments from year to year, as the demand increases and your product becomes known.

Associations.—Selling through an exchange or association has been worked out very satisfactorily in the handling of many fruit crops. The author predicts that the time will come when this method of selling the pecan crop will be put into effect. There are centers where local association may become a necessity at no far distant date, and if these are formed, as they doubtless will be, they will eventually be organized into one central association, handling the crop of many different states. It will require careful thought and most excellent management, but both these requisites

can be supplied. Such an association could be modeled after the California or Florida Citrus Exchange.

By this method, better freight rates can be secured, claims can be collected better, a more uniform product can be handled, and better distribution can be secured. "Over supply" is usually lack of proper distribution. Those who have the best interest of the industry at heart should carefully consider these suggestions, both for their own immediate localities and for the industry as a whole, from Virginia to Texas, from Indiana to Louisiana.



Frotscher pecans—gift package.

CHAPTER XIV

PECAN KERNELS

PECAN nuts are used in a great variety of ways. Not so many years ago, they were used almost entirely for dessert purposes, now they are used in the making of confections, pastries and foods of various sorts. The large candy manufacturers use the kernels by the ton and are not able to secure enough for their trade. It is probably not an over-statement of fact to say that nuts of some sort, and pecans largely, enter into composition of fifty per cent. of all the higher-grade candies.

The baker now uses them in a variety of ways not dreamed of a few years ago, and the caterer compounds them into salads, uses them in cakes and in dishes of unknown composition but delicious flavor. The housewife uses them in various ways in her kitchen and on her table. They enter into our daily living as never before. We dare to say that no fruits are now put to a wider range of uses than the nuts, and it does now appear that through the medium of the extracted kernel, nuts will have their greatest sale. We are too lazy to do our own cracking or too much occupied with other things.

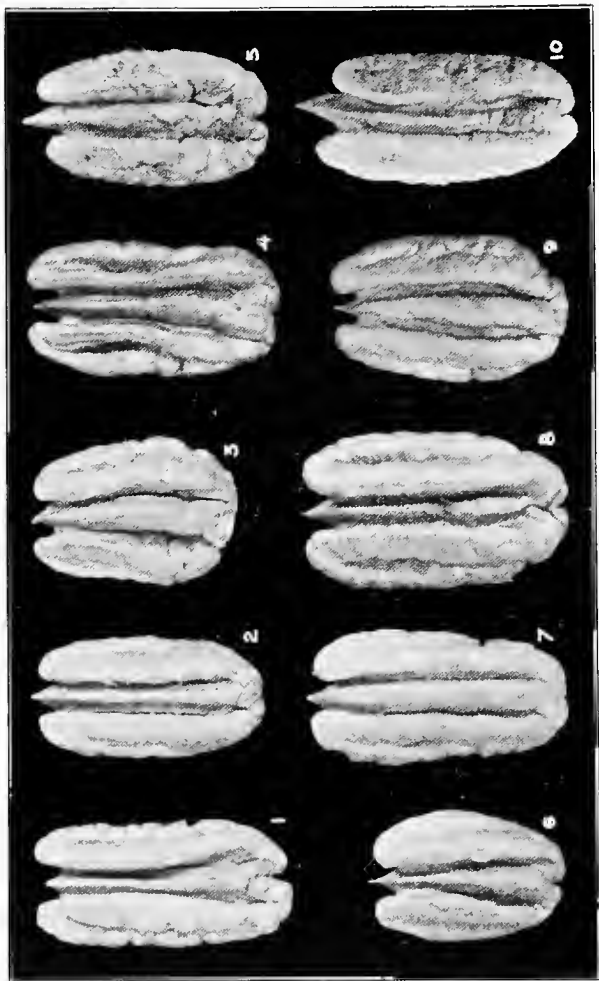
This tendency has called into being two new industries, the making of power nut-crackers and the extracting of nut kernels. Crackers are now made to be driven by electrical, steam or gas power, and the percentage of perfect half kernels turned out by them is very large. Factories have been established for the sole purpose of extracting kernels. Hence, we see that several industries of different kinds have sprung into

being as a result of the present day tendencies in this comparatively new field of horticulture.

Today, the extracted pecan kernels are weighed out by the pound and sold over the counter in all large candy stores in the country, and in a large number of grocery stores they can likewise be secured. They are sold (salted and unsalted) in jars of various shapes, sorts and sizes. They are used in the making of candies and many different kinds of confections. They have found and are holding a place at the soda-fountain. Foods are manufactured from them, and they have become a source of fat for the vegetarian. The kernels placed on the market, in glass jars, usually retail at about seventy-five cents per pound. Unfortunately, the stock is not kept in such a way as to create a desire for more on the part of the consumer after he has tried one package. They are too frequently old, stale and rancid. When the kernels are carried through the heat of summer in an ordinary jar, to the contents of which the air has access, this is invariably the case, and some new method of packing them must be introduced if this method of disposing of the product is to increase in favor, as it should.

PACKING EXPERIMENTS

In the spring of 1905, the author, through the kindness of the Beech-Nut Packing Company, Canajoharie, N. Y., was enabled to undertake some experiments which gave an indication, at least, of what may be done in keeping pecan nuts and meats in fresh condition. In January, 1905, pecans of the previous October crop were secured and forwarded to the Packing Company. They extracted the kernels from some of the nuts and, on February 2, 1905, placed extracted meats in one set of vacuum jars and nuts in the other. A portion of each of these sets was forwarded to the author



Pecan kernels.

1. Frotzcher; 2. Curtis; 3. Moneymaker; 4. Pabst; 5. Russell; 6. San Saba; 7. Schley; 8. Stuart; 9. Success; 10. Van Deman.

for observation and examination. The vacuum was not absolute, though nearly so. Most of them were put up at $-28\frac{4}{10}$, while the perfect vacuum under normal condition would be about -30 . The jars were the ordinary ones used in putting up the Beech-Nut products. These jars were opened from time to time, the last of the extracted meats being opened about three years after they were put up. On April 22, 1910, the last jar of nuts was opened, and was pronounced by a number of competent judges to be at least as good as a large portion of the crop of October, 1909, kept under usual conditions. They had kept well, and, when one considers the fact that the nuts were exposed to ordinary air and climatic conditions from October, 1904, to February, 1905, then sealed up and kept under the same conditions until April, 1910, their state of preservation and freedom from rancidity was astonishing. The jars were kept under ordinary conditions, being placed on a shelf and subject to light and varying climatic changes. They were not covered in any way. This opens up an exceedingly interesting field for further investigation, but there is no question but that a vacuum glass jar will keep either kernels or nuts in good edible condition and free from rancidity for a very considerable time. Extracted kernels can be kept in cold storage in ordinary jars for a long time, but soon become off flavor when exposed to the usual summer heat. Pecan kernels held for sale in the ordinary way should be kept in cold storage, just as butter or cheese is kept. We are not aware that the kernels are being put on the market in the vacuum package at this time, and, for the present, at least, the only certain way of procuring good fresh pecan kernels is to secure fresh nuts,—those which have been kept over in cold-storage are good,—and crack them at the time when they are needed. For the household, an ordinary pair of nut-crackers will answer, but they should be of a particular

type. The jaws should be formed with sharp-cutting edges.

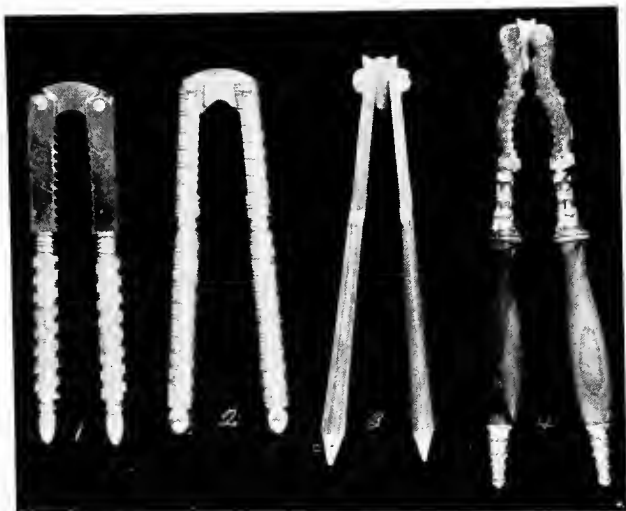
NUT-CRACKERS

In the accompanying illustration, four kinds of nut-crackers are shown. The two at the right are reversible. The best pair is represented at the extreme left of the engraving. The bars are square, the grooves in them are curved inward leaving the teeth sharp and pointed out flush with the edge.

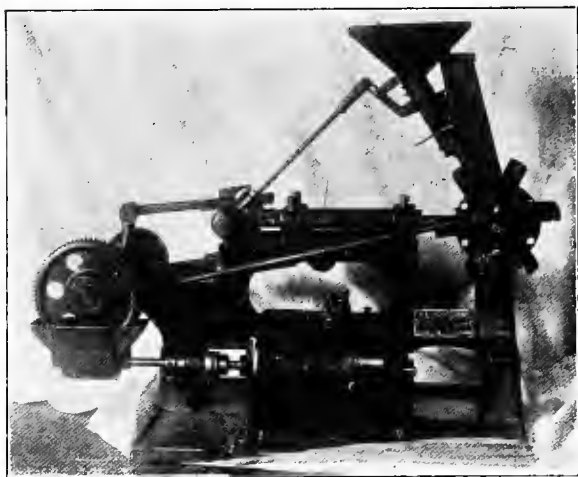
To remove the kernels without breaking, grasp the nut with the crackers as close to the end as possible, and gently but firmly apply sufficient pressure to force the sharp teeth of the crackers into the shell. Revolve the nut and repeat the operation until the end is marked with a ring of indentations. Then apply a little greater pressure to start a slight crack, and follow the crack around until the end of the shell drops off. Treat the opposite end in the same way. Next, place the nut lengthwise between the crackers, so they will grasp the side, having the backs of the two halves of the kernel, not the space between the halves, toward the bars. This must be emphasized, because, if pressure is applied at right angles to the edges of the halves instead of against their backs, the chances are that they will be broken when the shell is broken. Having the crackers in position, apply sufficient pressure to crack the shell. Shift the crackers a little to one side of the crack, apply pressure again and a piece of the shell breaks out. A few gentle squeezes will remove the remainder of the shell, and the kernel drops out intact.

A hand-power cracker, capable of quite efficient work, is manufactured by Thomas Mills and Bro., Philadelphia, Pa. It has a capacity of one hundred pounds per day, and is capable of giving ninety per cent. of perfect halves.

For factory use, two machines for extracting kernels



Nut-crackers of different types.



Woodson's power kernel extractor.

at a rapid rate have been invented, one by Mr. Robert E. Woodson, St. Louis, Mo., and the other by Mr. Grim, New York City. These make it possible to extract pecans in large quantities for commercial purposes. The nuts are fed into a hopper and the machine then takes care of them. In regard to the Woodson machine, shown in the adjoining illustration, the inventor says that "in cracking one hundred pounds of nuts, there were obtained $39\frac{1}{2}$ pounds of perfect halves and $3\frac{1}{2}$ pounds of broken pieces. This test shows 92 per cent. of perfect halves. I do not claim that this result may be obtained at all times and under all conditions, for the hardness of the shell and the dryness of the nuts make a difference in the results."

Pecans which have become somewhat dry should be soaked in water over night. This renders them much more easily cracked.

PECAN OIL

Oil extracted from almonds, peanuts, cocoanuts and other nuts is now used for various purposes, and at no distant time it is probable that pecan oil may also be placed on the market. Only the cheaper, inferior grades of nuts can be used in oil-making, as the larger and better quality of nuts are worth too much for dessert purposes.

Ordinary nuts will run about fifty per cent. kernels, and these kernels analyze about seventy per cent. oil or fat. On this basis, one hundred pounds would give approximately thirty-five pounds of oil. Of course, the better grades of nuts will give sixty per cent. kernels, and would consequently yield more oil.

Pecan oil might be used as a salad oil. It might be put to other culinary uses, as well as finding a possible place among medicinal oils.

CHAPTER XV

PECAN JUDGING

EVERY grower of the pecan should be a judge of pecan nuts; and the ideas of growers, while they may differ on certain minor points, should agree on the more important characters of the nut. To enable growers, nurserymen and judges to work on a common standard of merit, a scale of points, in which each individual characteristic of the nut may receive a certain fixed number of credits, is indispensable.

The scale of points adopted by the National Nut Growers' Association at the second annual meeting, held in New Orleans, La., in 1903, given below, is designed primarily to cover commercial dessert varieties, or those grown for the dessert trade. It is doubtful whether, from this standpoint, this schedule can be improved upon, but the amateur would be inclined to give greater weight to quality. Large size viewed from the dessert standpoint is highly desirable, but, for the confectioner's trade, small or medium-sized nuts are required.

PECAN NUTS	
<i>External characters.</i>	Points.
Size	20
Form.....	5
Color.....	5
<i>Shell Characters.</i>	
Thinness.....	10
Cracking quality.....	20
<i>Kernel characters.</i>	
Plumpness	20
Color.....	5
Quality	15
Total.....	<hr/> 100

<i>Tree</i>	<i>Points</i>
Vigor.....	10
Habit.....	10
Toughness.....	10
Resistance to disease, insects.....	10
Precocity.....	10
Uniformity of ripening.....	10
Productiveness.....	40
<hr/>	
Total.....	100

The rating of a variety to be determined by averaging the rating of nut and tree.

EXPLANATORY NOTES, CHARACTER AND CONDITION OF SAMPLES

All samples submitted for judging shall be fair average samples of the crop, and not selected specimens. They should be tree-ripened, and should be thoroughly cured before judging. Polishing, coloring or other manipulation to disqualify:

Size.—The nuts should be large and reasonably uniform in size; nuts running smaller than 100 per pound to be disqualified.

Form.—The nuts should be symmetrical in form and reasonably smooth of surface.

Color.—The shell should be bright and clear in color, without excess of surface markings.

Thinness.—The shell should be sufficiently thin in proportion to size of nut, to crush readily.

Cracking Quality.—The shell should be brittle and should separate readily from the kernel, leaving it clean and in perfect halves.

Plumpness.—The kernel should fill the shell and must be smooth externally, with solid meat of fine and uniform texture, free from internal cavities and with high relative weight of kernel to shell.

Color.—The kernel should be uniformly bright and attractive in color.

Quality.—The flavor should be sweet and rich, free from bitterness or astringency of either meat or skin.

CHAPTER XVI

WHAT VARIETIES TO PLANT

WHAT varieties shall I plant? An easy question to ask—a difficult one to answer; for, though the one attempting a reply may know something of varieties, their size, quality and prolificness, there is always an unknown personal equation entering into the problem.

IDEALS

Frequently we hear it stated that such and such a variety is the ideal pecan for planting. We trust we may be pardoned for saying so, but, usually we have to smile, inwardly of course, when the remark is made. Why? Is there not an ideal pecan? or can it not be found or produced or bred? Is there not an ideal thickness of shell and percentage of kernel and standard of prolificness? To all of which we answer, "Yes!"

But man has chased the ideal up and down the ages, and never found it. He has worked and fought and died for it, still it ever has eluded his grasp. The ideal has been and is the lodestone of human progress, its pursuit the uplifting motive that has made for elevation in the social scale and the betterment of humanity. Now, you're off the track; come back!

Ideal pecans? Yours or mine or your neighbor's? Whose?—Ideal as a dessert nut or for commercial purposes? Which?—Ideal for Texas or Alabama or Georgia? Where? Ideal early, medium or late? When? Two inches long or three and a half? Don't you see that there may be as many ideals as conditions

to be filled, and that ideals exist mostly in men's minds? And more, set up your ideal and secure it. Tomorrow or sooner, a new ideal flits into the old one's place, and the pursuit goes on. It must always be so. If not, we sit down self-satisfied,—a dangerous condition. Yet, set up your ideal, whatever it may be, and work for it, search for it; it will be good for you and the industry. Every individual interested in the pecan should do so. Wonders will result.

PERSONAL PREFERENCES

Every variety of importance has its advocates. If a man has a preference for a certain variety, and is interested in it, let him plant that variety largely, if it is adapted to his soil and climatic conditions. He will be likely to give it better care and attention than he will a variety for which he has no particular liking, or one which he may regard even with disfavor. The commercial grower should confine himself to a few varieties. Three or four sorts are sufficient, and it is best to plant neither more nor less. It is not safe to plant one alone. The amateur, on the other hand, who grows pecans for the love of it, will naturally plant many varieties; for he is more interested in watching them grow than in what he expects to get out of them in a monetary way.

It is a safe rule to grow what the market wants. It is a great deal easier to grow what people want than it is to get them to purchase what they don't want. The market for pecans is naturally divided into two sections: one wants large nuts of fine appearance and quality for the dessert trade, the other prefers small and medium-sized nuts for the usual commercial channels—the confectioners' and caterers' trade and kitchen use. A grower may, with certainty of success, direct his efforts in either of these directions; but he

can not, with reasonable hope of gain, force his wares, grown for the commercial trade, into the dessert trade, or vice-versa.

COMMERCIAL PLANTINGS

In selecting varieties for commercial plantings, the first thing that must be carefully considered is the adaptability of the variety to the local conditions. It will not do to choose a variety just because it suits the planter's fancy or just because it does well somewhere else. The large grower must sometimes leave high quality out of consideration, and plant varieties that will pay. His first consideration must be nuts and plenty of them. Some varieties may be grown almost anywhere, while others are much more limited in their range of successful culture.

If an orchard of pecans is set out for home use, the first point to be considered is quality. Shy bearing and undesirable tree characteristics may be overlooked, and a considerable number of varieties should be planted.

Not all varieties are equally hardy, and some may not ripen their wood and fruit early enough in autumn to avoid late killing frosts. Such varieties should not be selected for planting in sections where there is danger of such injury, viz., principally along the more northerly outskirts of the pecan area. In such regions early varieties should be planted, for early ripening of fruit and wood usually go together in the pecan.

Many varieties are late in coming into bearing; others begin to bear while quite young. This difference in precocity is worthy of consideration. Other things being equal, those varieties which begin to bear early and are prolific should by all means be given the preference. Three of the worst faults which a variety may have are partial barrenness or shy bearing, poor filling quality

and susceptibility to disease. In the second particular the worst sinners are the larger varieties, and in point of filling quality, medium and small-sized varieties will, in nearly all cases, be found to have the greatest range of adaptability. The larger varieties are more likely to succeed on rich lands where the rainfall, particularly during the summer months, is great.

In addition to setting out an orchard of what he believes to be the best varieties for his section, or which experience has taught to be the best, the grower should, if he is thoroughly interested in his work, plant a tree or two of a number of other different kinds, to test their merits and to learn something of their characteristics.

HOW MANY NUTS IN A CLUSTER?

The number of nuts borne in each cluster at the end of the fruit-spurs may or may not have a bearing on the quantity of nuts produced. Other things being equal, the more nuts in a cluster the greater the yield. This feature has not, however, been carefully worked out. The following records of ten clusters for each variety, counted without selection, may be taken as representing the average behavior of the varieties. In some seasons, and in certain localities, they may behave differently:

Bolton	3	1	2	2	5	2	5	1	4	1.	Total 26
Curtis	4	4	3	4	3	3	5	4	3	3.	Total 36
Delmas	5	4	4	2	4	2	3	4	4	3.	Total 35
Frotscher	3	3	4	4	3	2	1	2	4	2.	Total 28
Rome	4	3	3	1	3	3	1	3	3	3.	Total 27
Russell	1	3	4	4	2	2	2	2	3	4.	Total 27
San Saba	5	2	3	2	4	3	4	3	3	2.	Total 31
Schley	4	3	3	4	4	2	5	4	3	3.	Total 35
Stuart	3	3	3	2	3	3	2	2	3	3.	Total 27
Success	3	5	4	1	4	4	3	4	4	3.	Total 35
Teche	6	2	2	2	4	3	4	4	4	4.	Total 31
Van Deman	3	3	3	2	2	3	3	1	3	3.	Total 26



The rugged framework of a thirty-two years old pecan tree, in Captain Williamson's yard, Raleigh, N. C. Has borne 400 pounds in a single crop.

VARIETIES RECOMMENDED

The following recommendations for different sections have been made by growers and others in touch with pecan culture in different parts of the cultural area. These lists may be changed with additional knowledge, but they represent fairly safe knowledge for present plantings. Our knowledge of the behavior of varieties in different localities is becoming more accurate. As many varieties have only recently been brought into cultivation, it is, of course, quite impossible to say what their behavior will be in many places. Time alone will prove their merit.

ALABAMA. Prof. R. S. McIntosh, Auburn, Ala., believes that Stuart, Van Deman, Pabst and Schley are good varieties for Alabama.

Cliff A. Locke, Eufaula, Ala., is much pleased with Success, Stuart and Schley, and hopes for good results with Frotscher, Pabst and Alley. The last-mentioned three are too young yet.

FLORIDA. Dr. J. B. Curtis, Orange Heights, Fla., says: "I would plant only two varieties—Curtis and Teche."

H. K. Miller, Monticello, Fla., recommends Schley, Delmas, Stuart, Success, Teche, Moore (long), Moore (round).

Jas. A. Bear, Palatka, Fla., favors Curtis, Teche, Stuart and Moneymaker, for his section.

H. S. Graves, Gainesville, Fla., says: "The following have proven superior to date,—Curtis, Van Deman, Teche and Delmas."

R. C. Simpson, Monticello, Fla., has given two lists for his immediate section; the first containing those which have made the best showing to date, and the second those which are very promising, and which may later be transferred to list number one: List 1,—Schley, Delmas, Stuart and Moore. List 2,—Curtis Success, Moneymaker and Teche.

GEORGIA. J. B. Wight, Cairo, Ga., favors Frotscher as the best variety for his section, so far. Schley, Stuart and Van Deman are doing well.

Dr. J. F. Wilson, Poulan, Ga., says: "Frotscher, Teche, Curtis and Schley are my choice, at present."

Herbert C. White, Horticulturist, DeWitt, Ga., recommends Stuart, Schley, Alley, Frotscher, Delmas, Pabst, Teche, Russell, Russell No. 2 and Van Deman.

LOUISIANA. Sam H. James, Mound, La., gives as his best list, Pabst, Moneymaker, Van Deman, Stuart, Carman, Success and Schley.

Wm. Nelson, New Orleans, La., of the older sorts, recommends Frotscher, Centennial; and, of the newer ones, would plant Pabst, Success, Russell and Schley.

Prof. H. E. Van Deman, Ferriday, La., says that Stuart and Van Deman are still first; with Claremont, a new variety, third. Success, Schley and Pabst he regards very favorably.

W. G. Weeks, New Iberia, La., says: "To my mind, the best varieties for this locality are Frotscher, Stuart and Van Deman."

A. K. Clingman, Keithville, La., says: "We consider the following three varieties the best in our section, everything considered,—Stuart, Schley and Williams."

John F. Jones, Jeanerette, La., advises planting Stuart, Schley, Frotscher and Russell, in his section.

MISSISSIPPI. Chas. E. Pabst, Ocean Springs, Miss., says he would plant Pabst, Stuart, Van Deman, Delmas and Success.

Theo. Bechtel, Ocean Springs, said in 1906: "My selection, at present, for this section, would be in the order named: Success, Stuart, Pabst, Frotscher, Russell, Van Deman;" and now he says he would add some Hall.

NORTH CAROLINA. W. N. Hutt, State Horticulturist, Raleigh, N. C., says: "I would recommend for growing in North Carolina, the following varieties,—Stuart, Van Deman, Mantura and Appomattox."

SOUTH CAROLINA. John S. Horlbeck, Charleston, S. C., regards Van Deman as the best for his section, with Stuart second.

TEXAS. E. E. Risien, Rescue, Texas, recommends San Saba, Texas Prolific (Sovereign), Colorado and Kincaid as the best four for his vicinity.

E. W. Kirkpatrick, McKinney, Tex., writes that the native forms are best adapted, but regards Stuart highly.

VIRGINIA. Wm. N. Roper, Petersburg, Va., recommends Mantura, Appomattox, Indiana and Stuart.

NORTHERN LOCALITIES. The attention of those desiring pecan trees for the extreme northren and north-western edge of the pecan area is directed to such varieties as Appomattox, Hodge, Indiana, Hinton, Major and Mantura.

CHAPTER XVII

VARIETIES OF PECANS

WHILE the list of varieties of pecans is comparatively small, yet a surprisingly large number of names has been used. The attempt has been made to collect all the names which have appeared in different publications. These have, presumably, all been applied to some pecan at some time or other, but many of them have never been propagated by budding or grafting, and a very large proportion of them have been lost track of entirely. In short, they are now represented by names only. However, they are all given, for the reason that it would be well not to apply any of these names to other varieties. It might be well to emphasize the fact that many meritorious varieties would be the better for renaming.

At this time, the following varieties of pecans are listed for sale in nursery catalogues: Alley, Appomattox, Attwater, Bolton, Bradley, Busseron, Capital, Carman, Centennial, Claremont, Clark, Colorado, Collingwood, Concho, Curtis, Daisy, Delmas, Dewey, Early Red, Formosa, Fort Gaines, Frotscher, Georgia, Hadley, Halbert, Hale, Hall, Havens, Hinton, Hollis, Indiana, Jacocks' Perfection, James, Jerome, Kinkaid, Krak-Ezy, Longfellow, Louisiana, Major, Mantura, Mobile, Moneymaker, Moore (round), Moore (long), Nelson, Pabst, Pan-American, President, Randall, Riverside, Rome, Russell, San Marcos, San Saba, Schley, Sovereign, Sparta, Steckler, Stuart, Success, Teche, Van Deman, Young, No. 12.

In the original descriptions, it will be noted that the

thickness of the shell is given in millimeters. A piece of the shell, about the center of the side covering the back of the half kernels, was accurately measured. These measurements must not be regarded as absolute, but they are comparative. All nut illustrations are natural size.

For the origin and synonymy of many varieties, credit must be given to the excellent work of Mr. William A. Taylor, of the United States Department of Agriculture, who has probably done more than any one else to straighten out the tangled nomenclature of the pecan.

CLASSIFICATION OF VARIETIES

Heretofore, no attempt has been made to group or classify the different varieties of pecans. Classification does not become necessary until the number of varieties has increased sufficiently. The following classification of the varieties with which the author is acquainted is based entirely upon the shape of the nuts. No classification of those varieties of which descriptions are copied has been attempted, as the descriptions are frequently so meager as to render it impossible:

1. *Varieties*: Round or roundish oblong. Types.—Post, Hollis, Moneymaker.

Bacon, Bolton, Extra Early, Georgia, Hinton, Hollis, Major, Moneymaker, Post, Randall, San Saba, Thomas.

2. *Varieties*: Oblong, rounded at the base, blunt and quadrangular at the apex. Types.—Pabst, Success.

Frotscher, Pabst, Pegram, Perfection, Success, Sweetmeat.

3. *Varieties*: Oblong in general outline, rounded, blunt and abruptly tipped at the base, and abruptly short-pointed at the apex. Types.—Russell, Stuart.

Alley, Carman, Capital, Franklin, Havens, Jacocks, James No. 1, Kincaid, Lewis, Moore, Morris, Russell, Stuart.

4. *Varieties*: Oblong cylindrical to almost conical, rounded at the base, sloping from the middle or above to the sharp-pointed apex. Types.—Jewett, Curtis, Schley.

Clarke, Curtis, Daisy, Dalzell, Dewey, Hume, James' Giant, Jewett, Kennedy, Mammoth, Rome, Schley, Williams, Young.

5. *Varieties*: Usually long in proportion to thickness, more or less pointed at both base and apex. Types.—Atlanta, Ideal, Schaifer.

Atlanta, Centennial, Delmas, Domestic, Ideal, James' Paper-shell, Ladyfinger, Longfellow, Louisiana, Monarch, Money-maker, Schaifer, Van Deman.

6. *Hybrid Varieties*: Nussbaumer, McCallister, Schneck, Pooshee, Westbrook.

VARIETIES DESCRIBED

ALBA. Size below medium, cylindrical, with pointed apex; cracking quality good; shell of medium thickness; corky shell lining thick, adhering to the kernel; kernel plump, light colored; quality good. (Report Secretary Agriculture, 1893; p. 295, 1894.)

ALLEY. Size medium, $1\frac{5}{8} \times \frac{7}{8}$ inches; form ovate; color grayish-brown with a few purplish-black markings about the apex; base rounded, tipped; apex abruptly short-pointed, slightly four-angled; shell brittle, thin, .8 mm., partitions thin; cracking quality excellent; kernel full, plump, bright straw-colored, sutures narrow, moderately deep, secondary sutures slightly marked; texture firm; compact fine-grained; flavor sweet, delicate, pleasant; quality very good and a good keeper.

Described from specimens received from Mr. Theo. Bechtel, Ocean Springs, Miss.

APPOMATTOX. Small, $1\frac{1}{2} \times \frac{3}{4}$ inches, oblong; apex tapering, rather abrupt, sharp-pointed; base sharp-pointed; color light brown with few, small, dark markings, shell thin, cracking quality good; partitions thin; kernel slender, plump and full; sutures narrow and deep; color light, clear, brownish yellow; texture firm; quality very good.

The parent tree is a seedling, thirty-five years old, at Petersburg, Va. The nuts fill well, and the tree is an annual bearer. It was propagated and introduced by Wm. N. Roper, in 1906. It is recommended for trial in the colder pecan areas.

ATLANTA. Size medium, $1\frac{7}{8} \times \frac{7}{8} \times \frac{1\frac{1}{8}}{8}$ inches; ovate, compressed color dull gray, liberally specked with small, dark dots, splashed with purplish markings from middle to apex; base sloping, blunt-pointed; apex sloping, short-pointed; shell brittle, moderately thin; partitions rather thick, corky; cracking quality quite good; kernel full, plump; sutures narrow, of medium depth, secondary sutures lacking; color light yellowish brown, bright; texture solid, compact; flavor sweet, good; quality very good.

Originated by G. M. Bacon, DeWitt, Ga., and first catalogued about 1900.

BACON. (Syn.: Bacon's choice.) Size small, $1\frac{1}{4} \times \frac{7}{8}$ inches; rounded, compressed toward the apex; color dull brownish gray, thickly dotted with dark specks, liberally splashed with purplish-brown markings toward the apex; base rounded; apex abruptly blunt-pointed; shell thin, .85 mm.; cracking quality excellent; partitions thin, papery; kernel roundish, bright, light brownish yellow, plump, full, smooth, sutures broad, of medium depth; flavor sweet, nutty, good; quality very good.

A small pecan of good quality, originated by G. M. Bacon, DeWitt, Ga., and introduced by him in 1900.

BARTOW. Medium size, thin shell and fine flavor. (Bacon's Catalogue, p. 29, 1904.)

BEAUTY. Illustrated in "The Pecan and How to Grow It." (Stuart Pecan Company, 1893, p. 59, Fig. 5.)

BELLE. Medium, ovate, quality very good. (J. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)

BIEDIGER. Listed in "Nut Culture in the United States," United States Department Agriculture, Division Pomology, p. 64, 1896.

BILOXI. (W. R. Stuart, Ocean Springs, Miss.) Medium size, cylindrical, pointed at each end; surface quite regular, light brown; shell thin; cracking quality medium; kernel plump, with yellowish-brown surface; free from astringency, of good quality, and keeps well without becoming rancid. Introduced several years ago by W. R. Stuart as Mexican Paper-shell, but the name has since been changed to Biloxi. (Report Secretary Agriculture, 1893, p. 295, 1894.)

BLACK JACK. Listed in "Nut Culture in the United States," United States Department Agriculture, Division Pomology, p. 64, 1896.

BOLTON. Size medium, $1\frac{3}{8} \times 1$ inches;



Money-maker,
Post, San Saba,
Half kernel of Bacon.

ovate conical; color dull gray, marked with purplish-brown blotches about the apex; base rounded; apex angled, blunt, sloping gradually from the center; shell thick, 1.9 mm.; partitions thick; cracking quality medium; kernel brownish yellow, somewhat wrinkled; sutures broad, deep, inner surface wrinkled, broadly oval in outline, texture rather open; flavor sweet, nutty; quality good.

Originated in Jefferson county, Florida. Described from specimens received from J. H. Girardeau, Monticello, Fla.

BRACKETT. Named for our United States Pomologist. It is a very fine market pecan, unexcelled in richness of flavor, and has a thin shell. Trees are fine growers, heavy bearers, and with proper care and attention come into bearing at six years old. (Bacon's Catalogue, 1900.)

BRADLEY.* Form long, oval to cylindrical, somewhat compressed, with a rather long, pointed base and long, angular apex; surface smooth; size medium, 65 to 80 nuts to the pound; color bright grayish brown with dark reddish black markings near apex; shell thin, rather hard, cracking easily and releasing kernel readily; kernel brownish, plump, considerably corrugated and broadly grooved; texture firm, compact; flavor sweet, quality very good. Season early.

The tree resembles its parent, the Frotscher, considerably, is a vigorous grower, of erratic, spreading habit, with narrow, thin foliage and carrying its fruit-spurs well through the tree. The young wood is smooth and brown, with numerous large, light dots. Bradley was raised as a seedling by Mr. C. D. Griffing, at Macclenny, Fla., about 1886. It was catalogued and introduced by the Griffing Bros. Company in 1898.

BRIDEN. Listed in "Nut Culture in the United States," United States Department Agriculture, Division Pomology, p. 64, 1896.

BULLETS. A decided novelty in pecans. As its name indicates, it is of bullet shape, being almost perfectly round. It has a fine flavor, shell is very thin. (Bacon's Catalogue, 1900.)

CAPITAL. Size medium to large, $1\frac{7}{8} \times \frac{7}{8} \times \frac{3}{4}$ inches; ovate oblong, compressed with well-marked sutures; color light brown streaked and splashed with purplish brown markings from center to apex; base rounded, blunt-tipped; apex abruptly short-pointed, nipped; shell brittle, of medium thickness, 1.3 mm.; partitions of medium thickness; cracking quality very good; kernel plump, filling the shell, brownish yellow in color, primary sutures broad

*Taylor. Yearbook, 1909.

and fairly deep, secondary ones well defined, running almost the length of the kernel; texture rather open; flavor good; quality good.

Described from specimens received from Mr. Theo. Bechtel, Ocean Springs, Miss.

CARMAN. Size medium, $1\frac{7}{8} \times \frac{3}{4}$ inches; oblong, compressed; color light yellowish brown, marked with splashes and blotches of brownish black about the apex; base rounded, blunt-tipped; apex abruptly-pointed, shouldered and four-angled; shell brittle, of medium thickness, 1.2 mm.; partitions thin; cracking quality very good; kernel long, slender, plump, straw-colored, sutures straight, narrow, shallow; texture firm, compact; flavor sweet, pleasant; quality very good.

Described from specimens received from Prof. F. H. Burnette, Baton Rouge, La. Originated and introduced by Mr. S. H. James, Mound, La.

CENTENNIAL. Size large, $2 \times \frac{7}{8} \times \frac{3}{4}$ inches; oblong, compressed, constricted in the middle, with well-marked sutures; color grayish brown, bright, marked with a few purplish markings in the grooves at the apex; base tapering to a blunt point; apex tapering, pointed, wedge-shaped, sometimes curved; shell medium thick, 1.5 mm.; partitions thin; cracking quality medium; kernel plump, full, brownish yellow, bright, sutures rather small, straight, secondary ones marked by a line, surface rather wrinkled; flavor sweet, delicate; quality very good.

Described from specimens received from Mr. J. F. Jones, Monticello, Fla. "The original tree stood on the Anita plantation of Mr. Amant Bourgeois, on the east bank of the Mississippi river in St. James Parish, La."* It was destroyed March 14, 1890, by the Anita Crevasse. Sixteen trees were grafted in 1846 and 1847 by the slave gardener, Antoine, of Mr. Telesphore J. Roman, owner of Oak Alley plantation. Two of these earlier trees are still standing. Nuts were exhibited at the Centennial Exposition, Philadelphia, in 1876, by Hubert Bonzano. Under the name Centennial, it was probably first catalogued by the late Richard Frotscher, of New Orleans, in 1885.

CHIQUITA. Small, ovate, shell medium, best, long keeper. (T. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)

CLAREMONT.† Form roundish ovate, with flattened base and short, blunt apex; size medium, 55 to 75 nuts to the pound; color dull grayish brown, with numerous purplish markings toward apex and scattered flecks over general surface, shell moder-

* Taylor. Yearbook, 1909.

† Taylor. Yearbook, 1909.

ately thick and rather hard, but cracking easily and releasing kernel exceptionally well; kernel plump, slightly corrugated and broadly grooved, of a pale yellowish color; texture compact, flavor sweet; quality good to very good. Season medium.

The tree is a strong, symmetrical, upright grower, with fruit spurs well distributed, bearing clusters of from 1 to 8 nuts, usually 3 or 4. The young wood is smooth and brown, with stubby, hairy buds. Though not yet fruited except on the original tree, the variety is apparently promising for the lower Mississippi valley. The original tree is a seedling about thirty years old, on Pecania Plantation, near Ferriday, La. The original tree has borne 450 pounds of nuts in a season. It was brought to notice and first propagated, in 1907, by Prof. H. E. Van Deman.



Curtis pecan.

CLARK. Size medium to large, $1\frac{3}{4} \times \frac{7}{8}$ inches; ovate oblong; color dull gray, with a few purplish spots about the apex; base rounded; apex blunt; shell brittle of medium thickness, 1.3 mm.; cracking quality medium; partitions thick, corky; kernel full and plump, with narrow sutures of medium depth, light yellow in color and marked here and there with black dots; texture rather open; flavor good; quality good.

Obtained of J. H. Girardeau, Monticello, Fla.

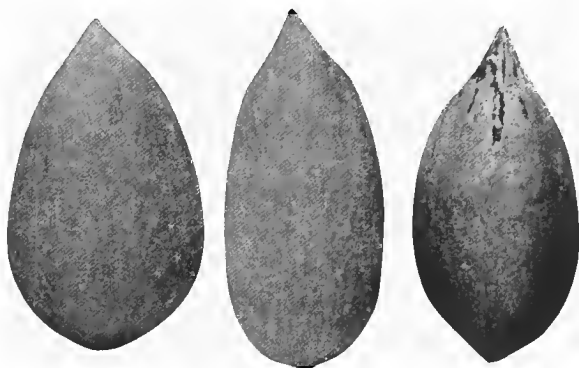
COLORADO. Mentioned by Andrew Fuller in "The Nut-Culturist," 1896, p. 169.

CURTIS. (Syn.: Curtis No. 2.) Medium, $1\frac{5}{8} \times \frac{7}{8}$ inches; ovate, conical, compressed; color brownish gray, marked throughout with dark specks and a few purplish specks about the apex; base rounded; apex sloping, pointed; shell thin, .7 mm.; cracking qual-

ity excellent; partitions thin, smooth; kernel bright straw-colored, plump, full, with narrow sutures of medium depth; texture compact, firm; flavor sweet, rich, nutty; quality excellent.

The original tree of this variety is to be found in the grove of Dr. J. B. Curtis, Orange Heights, Fla. It was raised from seed secured from Arthur Brown, Bagdad, Fla., and planted in 1886. It is a meritorious variety, being prolific, of good appearance and excellent quality.

DAISY. Medium to large, $1\frac{7}{8} \times 1\frac{3}{8} \times \frac{3}{4}$ inches; oblong cylindrical; color reddish brown, marked with a few purplish brown spots about the apex; base rounded; apex abruptly tapering, rather short; shell brittle, thin .93 mm.; cracking quality fairly



Mammoth.

Dalzell.

Kennedy.

good; partitions thick; kernel light brownish yellow, full, plump, with broad and very shallow sutures; texture firm and compact; flavor sweet, good; quality good.

Obtained of S. W. Peek, Hartwell, Ga.

The Daisy pecan was originated, about 1881, by Mr. F. R. Wagenfuehr, New Braunfels, Tex., and its propagation was begun, in 1900, by J. F. Lyendecker, Frelsburg, Tex. It is a vigorous grower and is said to be free from pecan scab.

DALZELL. Large, $2 \times \frac{7}{8} \times \frac{3}{4}$ inches; cylindrical flattened; dull grayish-brown, pebbled, marked with narrow splashes of purplish brown from center to apex; base rounded; apex abruptly sharp-pointed, four-angled and shouldered; shell rather thick, brittle, 1.4 mm.; cracking quality medium; partitions thin; ker-

nel long, narrow with deep sutures, yellowish brown in color, texture firm and compact; flavor sweet, good; quality good.

Obtained of S. H. Graves, Gainesville, Fla. The original tree* stands in a fourteen-acre grove, four miles south of Gainesville. The grove was planted in 1888, by Mr. J. R. Zetrou, now of Rochelle, Fla.

DELMAS. Size large, $1\frac{7}{8} \times 1$ inches; ovate, marked with four distinct ridges; color dull dark gray, marked with dark specks and blotches with purplish black from center to apex; base sloping, rounded, blunt; apex abruptly short-pointed, four-angled; shell thick, brittle, 1.4 mm.; partitions thick, corky; cracking quality good; kernel bright light yellow, sutures broad, open, shallow, secondary ones almost lacking, sometimes slack at bottom end; texture rather open; flavor sweet; quality good.

Described from specimens received from Mr. Theo. Bechtel, Ocean Springs, Miss. A large nut of fairly good quality, said in some cases to have been substituted for Schley, from which it is very distinct.

DEWEY. Medium to large, $1\frac{7}{8} \times \frac{3}{4}$ inches; ovate pointed; color dull gray, marked with splashes of purplish brown; base rounded; apex sharp; shell brittle and thin, .88 mm.; cracking quality very good; partitions thin; kernel full, plump, smooth, bright light straw-colored, with narrow sutures of medium depth; texture firm and solid; flavor sweet, rich, good; quality very good.

Specimens for description obtained of H. K. Miller, Monticello, Fla. Originated in Jefferson county, Fla.

DEWITT. An oddity, having the shape of a spinning-top. Shell is thin, and its rich meat is easily extracted on account of its peculiar shape. (Bacon's Catalogue, 1900.)

DOMESTIC. Large, $2 \times \frac{3}{4}$ inches; oblong ovate, compressed toward the base; color light reddish brown, with splotches of purplish brown throughout; base sloping, pointed; apex four-angled, abruptly blunt-pointed; shell brittle, thin, .95 mm.; cracking quality good; partitions thick, red, corky; kernel brownish yellow, plump, full, wrinkled on the sides with straight narrow, deep sutures and secondary ones fairly well developed; texture compact and fine-grained; flavor sweet, good; quality very good.

Specimens for description obtained from Frank H. Lewis, Scranton, Miss.

EARLY TEXAN. (Louis Biediger, Idlewild, Tex.) Size above medium, short, cylindrical, with rounded base and blunt conical

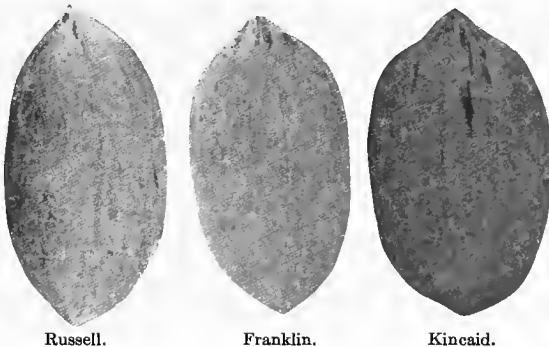
* Letter from Mr. S. H. Graves, dated June 19, 1905.

crown; shell quite thick, shell lining thick, astringent; cracking quality medium; kernel not very plump, of mild nutty flavor; quality good. (Report Secretary Agriculture, 1893, p. 295, 1894.)

EGG. (Syn.: Eggshell.) Medium; ovate; shell thin; partitions thin; kernel plump; quality good. D. L. Pierson, Monticello, Fla. Grown from seed procured from Louisiana in 1889. (Hume, Bulletin No. 54, Florida Experiment Station, p. 203, 1900.)

EXCELSIOR. A variety reported by Ladd Bros., Stonewall, Miss. (Listed in "Nut Culture in the United States," United States Department Agriculture, Division Pomology, p. 64, 1896.)

EXTRA-EARLY. Size medium to large, $1\frac{3}{4} \times 1$ inch; oblong ovoid abruptly-pointed; color grayish-yellow with small purplish blotches more or less over the whole surface; base rounded; apex abruptly-pointed, blunt; shell of medium thickness, 1.15 mm.;



partitions of medium thickness; cracking quality good; kernel filling the shell, plump, smooth, sutures broad, open, deep, not clasping the shell, color brownish yellow, texture open; flavor very good, quality fair.

Described from specimens received from E. E. Risien, San Saba, Texas.

FAUST. (O. D. Faust, Bamberg, S. C.) A pecan of large size; very long in shape; quite thin shell; kernel separating readily from shell; quality best. (Report Secretary Agriculture, 1891, p. 395, 1892.)

FAVORITA. A variety named and grown at one time by Arthur Brown, Bagdad, Fla. (Listed in "Nut Culture in the

United States," United States Department Agriculture, Division Pomology, p. 64, 1896.)

FRANKLIN. Size medium large, $1\frac{5}{8} \times \frac{7}{8}$ inches; ovate; color, dull grayish brown splashed about the apex with purplish black; base rounded, blunt-tipped; apex blunt-pointed, four-angled; shell brittle, of medium thickness, 1.32 mm.; partitions thick; cracking quality good; kernel full, plump, bright brownish yellow, primary sutures of medium width, deep, secondary ones almost lacking; texture rather coarse, fairly firm and compact; flavor sweet, good; quality very good.

Described from specimens received from S. W. Peek, Hartwell, Ga.



Frotscher pecan.

FROTSCHER. (Syn.: Frotscher's Eggshell, Eggshell, Olivier, Majestic.) Large, $1\frac{5}{8} \times 1\frac{7}{8}$ inches; cylindrical, ovate; color bright yellowish brown, with a few black splashes about the apex; base broad, rounded, .9 mm.; partitions thin; cracking quality excellent; kernel brownish yellow, dark veined, frequently slack at one end; sutures of medium depth, rather narrow, secondary sutures well marked; texture dry, rather coarse; flavor good; quality fair to medium.

The above description was made from specimens received from the J. Steckler Seed Company, New Orleans, La. The original tree stands in the garden of H. J. Pharr, Olivier, La.; the place was formerly owned by Oscar Olivier. The variety was first propagated by William Nelson, and catalogued as Frotscher's Eggshell, by Richard Frotscher, in 1885. The variety is precocious, productive, and succeeds over a wide range of country.

GEORGIA. (Syn.: Georgia Giant.) Size large, $1\frac{1}{2} \times \frac{1}{2} \times 1$

inches; rounded ovate; color brownish gray marked with splashes and dots of dark brown covering a good part of the surface; base rounded; apex tapering, blunt; shell brittle, medium in thickness, 1.3 mm.; cracking quality medium; partitions thick, corky, red; kernel bright reddish brown, plump, full, rather deeply sutured, two secondary sutures fairly well developed; texture compact, fine-grained; flavor sweet, good; quality very good.

Originated and introduced by G. M. Bacon, DeWitt, Ga. Reported from different sections as being affected by scab.

GEORGIA MELON. Size above medium, short, rather blunt at apex; cracking quality medium, shell thick; kernel plump, brown; meat yellow, moderately tender, pleasant, good. (Report Secretary Agriculture, 1893, p. 295, 1894.)

GIANT. Named, and at one time propagated, by Louis Biediger, Idlewild, Tex. (Listed in "Nut Culture in the United States," p. 64, 1896.)

GONZALES. (T. V. Munson, Denison, Tex.) Above medium size, with firm, clean shell; quality excellent. Originated in Gonzales county, Tex. (Report Secretary Agriculture 1893, p. 295, 1894.)

GRAFF. Named, and at one time propagated, by Louis Biediger, Idlewild, Tex. (Listed in "Nut Culture in the United States," p. 64, 1896.)

HALBERT.* Form short, roundish oval, compressed, with blunt base and very short, blunt, quadrangular apex; size medium, 65 to 70 nuts to the pound, color rather dull reddish brown with reddish black markings; shell very thin and rather brittle; cracking quality excellent, releasing the kernel easily and completely; kernel bright, very plump, deeply grooved, texture firm, oily; flavor sweet; quality very good.

The tree is described as of willowy growth, with slender, long-jointed wood. It is reported to be a very heavy bloomer, with fruiting clusters of 3 to 5 nuts, with sometimes as many as 8 nuts. Mr. Halbert reports that it has borne twenty-two crops during the twenty three years he has had the tree under observation. This pecan was found as a native seedling near Coleman, Texas, by Mr. H. A. Halbert, in 1886, and was named and introduced by him about 1901.

HAMILTON. (Syn.: R. Hamilton.) Illustrated in "Farm and Ranch," Vol. 23, No. 49, p. 1, Dec. 3, 1904.

HARCOURT. (Syn.: Helen Harcourt.) Size medium, short, slightly acorn-shaped; cracking qualities medium; shell rather

*Taylor. Yearbook, 1909.

thick, but very smooth inside; kernel short, very plump; meat yellow; very tender; rich; very good. (Reports Secretary Agriculture, 1893, p. 295, 1894.)

HAVENS. Large. $1\frac{1}{8} \times 1 \times \frac{7}{8}$ inches; ovate, compressed; color dull gray specked and splashed with purplish brown; base rounded, blunt-tipped; apex abruptly short-pointed, four-angled; shell brittle, thin, .85 mm.; partitions of medium thickness; cracking quality excellent; kernel very plump, full, brownish yellow marked with dark specks, primary sutures narrow, deep, secondary ones very slightly marked, bottom ends of halves of kernel divided; texture solid, compact, fine-grained; flavor sweet, good; quality very good.

Described from specimens received from Frank H. Lewis, Scranton, Miss.

HINTON. Medium or small size, 1 x 1 inch, rounded, somewhat flattened, with rather lumpy surface; base rounded, apex wedged, blunt, somewhat quadrangular; color grayish brown, with small black markings from the apex backward; shell thin, easily cracked; kernel separates easily, filling the shell well, corrugated with narrow sutures and fairly well marked secondary ones; half kernel almost circular, color light brown, texture medium, fine-grained; quality very good.

Hinton originated as a seedling in the S. I. M. Major grove at Henderson, Ky. It is well worthy of trial in the northern pecan areas. Introduced under the above name by Wm. N. Roper, Petersburg, Va.

HODGE.* Form oblong, obovate, compressed, tapering to a very prominent point, at base, with a square-shouldered, quadrangular, sharp-pointed apex; surface rather lumpy and somewhat irregular; size variable, ranging from 60 to 100 nuts per pound; color dull grayish brown, with numerous broad and long black stripes from apex to middle of nut; shell quite thick and hard, but brittle, with thin and brittle partitions, cracking fairly well, kernel oblong, tapering rather deeply grooved, but releasing the shell rather easily; color rather bright yellowish brown; texture moderately fine-grained; flavor sweet, nutty, quality good.

The Hodge nut originated as a seedling at York, Clark county, Ill., and was brought to notice by the owner, Mr. H. G. Hodge. It is one of the varieties which will likely prove desirable for northern pecan planters.

HOLLIS. (Syn.: Post's Select in part.) Size medium, $1\frac{1}{2} \times 1$ inches; form roundish ovate, marked with four more or less prom-

*Taylor. Yearbook, 1908.

inent longitudinal ridges; color dull brownish yellow, slightly splashed with purplish brown about the apex; base rounded; apex roundish, blunt; shell thick, 1.6 mm.; partitions thick; cracking quality medium; kernel plump, filling the shell, quite smooth, broadly and deeply grooved, oval in outline, light brownish-yellow in color; texture fine-grained; flavor delicate, good; quality good.

Described from specimens received from Herbert Post, Fort Worth, Tex. The seed nuts of this variety have been sold under the name, "Post's Select." It originated at Bend, San Saba county, Texas.

HUME. (Syn.: Curtis No. 5.) Size medium, $1\frac{1}{2} \times \frac{7}{8}$ inches; short, oblong cylindrical, marked with two longitudinal ridges; color grayish-brown marked with a number of short, narrow, purplish brown splashes; base rounded, very blunt-tipped; apex abruptly-pointed, flattened on two sides; shell thin, 8 mm.; partitions medium, corky; cracking quality very good; kernel full, plump, light yellowish brown, marked and dotted with dark spots, sutures straight, narrow, of medium depth; texture firm, compact; flavor sweet, pleasant; quality very good.

The original tree of this variety stands in the grove of Dr. J. B. Curtis, Orange Heights, Fla. It was grown from seed secured from Arthur Brown, Bagdad, Fla., in 1886. It is a shy bearer.

IDEAL. Medium, $1\frac{7}{8} \times \frac{3}{4} \times \frac{5}{8}$ inches; oblong, somewhat compressed, slightly constricted in the middle; color bright grayish brown marked with narrow strips of purplish brown at the apex; base sloping, pointed; apex sloping, pointed; shell thin, brittle, .9 mm.; partitions medium thick; cracking quality good; kernel full, plump, smooth, bright straw-colored; sutures very narrow, shallow; texture compact, firm, flavor sweet, good; quality very good.

Described from specimens received from S. W. Peek, Hartwell, Ga.

IDLEWILD. Medium size, thick shell, kernel good. Louis Biediger, Idlewild, Tex. (Thomas' American Fruit Culturist, 21st Ed., p. 452, 1903.)

INDIANA. Medium, $1\frac{1}{2} \times \frac{3}{4}$ inches, 65 to 70 nuts per pound, in size, oblong, carrying the greatest diameter well out to base and apex; apex quadrangular, abrupt, sharp, short-dointed, base rounded with small blunt point;



Indiana pecan.

shell grayish brown, with a few narrow purplish black stripes at apex; shell thin, easily cracked; partition medium thin, with considerable corky material; kernel full, plump, light colored; sutures narrow and of medium depth. Texture solid, fine-grained, sweet, nutty and of very good quality.

A seedling nut from Busseron township, Knox county, Indiana, first brought to notice by Mr. Mason J. Niblack,* Vincennes, Indiana. The original tree is fifty or sixty feet high and about five feet in circumference.

JACOCKS. (Syn.: Jacock's Mammoth.) Size large or very large, $1\frac{7}{8} \times 1$ inches; ovate, long; color bright yellowish brown; base rounded, abruptly blunt-pointed; apex blunt, four-angled, slightly wedged; shell brittle, of medium thickness, 1.3 mm.; partitions very thick, corky, red; cracking quality medium; kernel light yellowish brown, full or sometimes shrunken, sutures broad, of medium depth, secondary sutures well developed and fairly deep; texture open, rather coarse; flavor sweet, rather dry; quality fairly good.

Introduced by Mrs. C. W. JACOCKS, Formosa, Fla., from whom specimens were received.

JAMES GIANT. Medium to large, $2 \times \frac{7}{8}$ inches; ovate cylindrical; color brownish gray, marked with a few purplish splashes about the apex; base rounded; apex abruptly sharp-pointed with four rather prominent ridges; shell thin, 1 mm.; cracking quality good; partitions medium thickness; kernel bright light yellow, with narrow deep sutures and well-defined secondary sutures; texture firm, compact; flavor sweet, good; quality very good.

Obtained of Prof. F. H. Burnette, Baton Rouge, La.

JAMES No. 1. Size large, $2 \times 1\frac{3}{8} \times \frac{3}{4}$ inches; oblong, ovate, compressed; brownish yellow in color with a few brownish streaks about the apex; base rounded, blunt-tipped; apex abruptly blunt-pointed, four-angled, nipped; shell thin, .8 mm. partitions thin; cracking quality very good; kernel straw-colored, usually full and plump, though sometimes shrunken at one end; primary sutures broad, shallow, secondary ones well defined; texture solid, fine-grained; flavor very good, sweet; quality very good.

Described from specimens received from Prof. F. H. Burnette, Baton Rouge, La. Originated and introduced by S. H. James, Mound, La.

JAMES PAPERSHELL. Medium to large, $1\frac{7}{8} \times \frac{3}{4}$ inches; cylindrical or slightly quadrangular, slender; color yellowish brown marked with purplish splashes from center to apex; base rounded;

* See index of Literature.

apex abruptly-pointed, four-angled; shell thin, .96 mm.; partitions thin; cracking quality very good; kernel sometimes slack at one end, usually plump, smooth, bright brownish yellow; sutures narrow, shallow; texture firm, compact; flavor very good, sweet; quality very good.

Originated by S. H. James, Mound, La., and described from specimens received from Prof. F. H. Burnette, Baton Rouge, La.

JEWETT. Large, $1\frac{7}{8} \times \frac{7}{8}$ inches; obovate, flattened, angular, frequently constricted at the middle; color dull reddish brown, marked with large purplish splashes; base rounded; apex blunt four-angled, frequently curved; shell brittle, thick; cracking quality very good; partitions of medium thickness; kernel bright straw-colored, plump, smooth, somewhat triangular, with broad, open shallow sutures; texture firm, compact; flavor fair; quality medium.

Obtained of Chas. E. Pabst, Ocean Springs, Miss.

JUMBO. Size large, $1\frac{5}{8} \times \frac{7}{8}$ inches; ovate, slightly tapering; color grayish brown marked with a few narrow streaks about the apex; base rounded; apex four-angled, wedged, blunt-pointed; shell brittle, of medium thickness, 1.3 mm.; partitions thick, corky; cracking quality medium; kernel full, plump, straw-yellow in color, primary sutures broad, deep, secondary sutures almost lacking; texture fairly solid, fine-grained; flavor sweet, good; quality very good.

Described from specimens received from Summit Nurseries, Monticello, Fla.

KENNEDY. Large, $1\frac{3}{4} \times \frac{7}{8}$ inches; ovate-conical, flattened; color dull brownish gray, marked with a few narrow streaks of purplish black about the apex; base rounded; apex sharp-pointed, flattened on two sides; shell of medium thickness, .98 mm.; cracking quality very good; partitions thin; kernel bright, plump, full, smooth with narrow sutures of medium depth and secondary ones marked by a line; texture firm and compact, flavor rich, sweet; quality excellent.

Described from specimens received from Dr. J. B. Curtis, Orange Heights, Fla. Origin similar to Curtis.

KENTUCKY GEM. Listed. (F. H. Burnette, Bulletin Louisiana Experiment Station, Sec. Ser. No. 69, p. 875, 1902.)

KIDD. Illustrated in "Farm and Ranch," Vol. 23, No. 49, Dec. 3, 1904, p. 1.

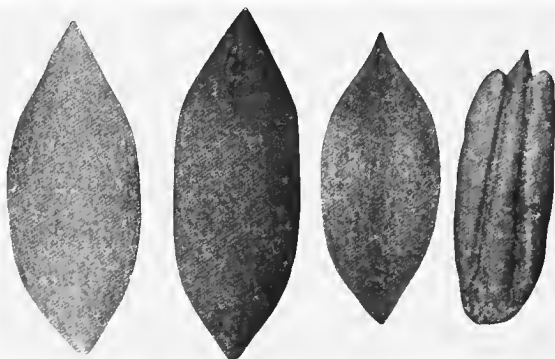


Hinton pecan.

KINCAID. Size medium to large, $1\frac{5}{8} \times 1$ inches; ovate compressed with well defined sutures; color light brownish yellow, bright, marked with narrow splashes of purplish black at the apex; base almost flattened, blunt-tipped; apex blunt-pointed, slightly wedged, four-angled; shell brittle, compact, thin, .98 mm.; partitions thick, corky; cracking quality very good; kernel very full and plump, smooth, bright, light straw-colored; primary sutures broad and deep, secondary sutures creased and very shallow; texture fine-grained, solid, compact; flavor sweet, rich, good; quality excellent; a good keeper.

Described from specimens received from E. E. Risien, San Saba, Texas. This apparently is a very good variety of pecan.

KRACK-EZY. Medium, ovoid, very thin shell, full of meat, best. (T. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)



Schaifer.

Ideal.

Ladyfinger.

Kernel of Atlanta.

LADYFINGER. Size small, $1\frac{1}{2} \times \frac{5}{8}$ inches; ovate pointed at both ends; color grayish brown marked with a very few small narrow streaks about the apex; base pointed; apex pointed; shell thin, 1. mm.; partitions of medium thickness; cracking quality excellent; kernel small and narrow, plump full, smooth, sutures narrow and shallow; flavor sweet, good; quality very good.

Described from specimens received from the Summit Nursery, Monticello, Fla. Originated on the grounds of this nursery company in Jackson county, Fla. A small nut of very fine quality, but too small to be recommended for extensive planting.

LAMAR. Large, oblong, pointed, medium shell, full, best. (T. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)

LEWIS. Large, $1\frac{5}{8} \times 1 \times \frac{7}{8}$ inches; ovate, compressed; color bright yellowish brown marked with purplish brown blotches three-quarters of the distance back from apex; base rounded, blunt-tipped; apex blunt-pointed, slightly wedged; shell thin, .98 mm.; cracking quality good; partitions thick; kernel plump or sometimes shrunken at lower end, wrinkled on the sides, bright, light yellow in color; primary sutures broad, of medium depth, secondary ones very shallow, wrinkled; texture fine-grained, solid; flavor sweet, pleasant; quality very good.

Described from specimens received from Frank H. Lewis, Scranton, Miss.

LONGFELLOW. Large, $1\frac{7}{8} \times \frac{7}{8}$ inches; obovate, angular, sutured; color light yellowish brown strongly marked with purplish black splashes throughout; base sloping, rounded; apex shouldered, abruptly pointed, flattened and quadrangular; shell of medium thickness, 1.15 mm.; partitions very thin; cracking quality good; kernel full, plump, somewhat wrinkled; light straw-colored, sutures narrow of medium depth; texture fine-grained, compact; flavor sweet, rich, nutty; quality excellent.

Described from specimens received from E. E. Risien, San Saba, Texas. A pecan of good quality and an excellent keeper.

LOUISIANA. Size medium. $1\frac{7}{8} \times \frac{7}{8} \times \frac{3}{4}$ inches; oblong cylindrical; color grayish brown, marked with splashes of purplish black towards the apex; base rounded, sloping; apex sloping, pointed; shell rather thick, 1.4 mm.; partitions of medium thickness; cracking quality very good; kernel full, plump, dark yellow, sutures broad, shallow; texture firm, compact; flavor sweet, good; quality very good.

Described from specimens received from Summit Nurseries, Monticello, Fla.

MAGNUM BONUM. Medium, ovate; shell thin; partitions thin; kernel plump, sweet; quality very good. (Hume, Bulletin No. 54, Florida Experiment Station, 1900, p. 207.)

MAJOR. Small, rounded, $1 \times \frac{7}{8}$ inch; base rounded, apex wedged quadrangular, blunt; color grayish brown with a few narrow black stripes about the apex; shell thin, brittle, easily cracked and the kernels broadly oval, come out unbroken in nearly all cases; light brown with narrow sutures of medium depth; texture moderately fine-grained, flavor sweet, nutty; good quality.

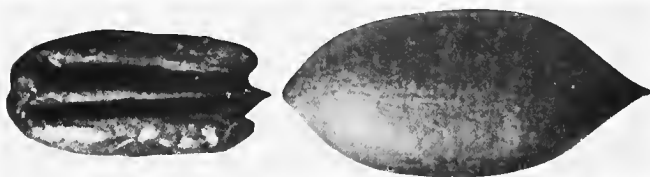
The parent tree of this variety is in the pecan grove of the late S. I. M. Major, Henderson, Ky. The tree bears regularly and well, and the nuts are always well filled. It is a type which commends itself, for many purposes, to the confectioner's trade.

This variety has been introduced and is being propagated by Wm. N. Roper, Petersburg, Va.

MAMMOTH. (Syn: Steckler's Mammoth.) Large to very large, 2 x 1 inches; form ovate; color dull gray, pebbled, with a very few dark lines at the apex; base rounded; apex flattened, four-angled, blunt; shell thick, 1.4 mm.; cracking quality very poor; partitions corky, very thick; kernel bright yellowish brown with broad, deep sutures and fuzzy lining adhering to kernel; texture coarse; flavor sweet and good; quality quite good.

Obtained of J. Steckler Seed Company.

MANTURA. Size large, $2 \times \frac{1\frac{3}{8}}{16}$, $1\frac{7}{8} \times \frac{7}{8}$ inches; oblong, oval; color dull reddish brown liberally marked with large, irregular black splashes; base tapered-point, blunt; apex sharp-pointed, nipped; shell very thin, .78 mm.; brittle, dense; cracking qual-



Mantura pecan.

ity very good; partitions thin; kernel dark straw-colored, plump, smooth, oval, with open sutures of medium depth; texture firm, solid; flavor sweet, nutty; quality very good indeed.

Described from specimens received from Wm. N. Roper, Petersburg, Va., by whom it was named and introduced in 1906.

The original tree of this variety stands on the Mantura homestead, in Surry county, Va., two miles south of the James river, now owned by W. P. Wilson. Mr. Wilson's mother planted four trees from nuts secured from a tree at Surry Courthouse, Va., the Mantura being one of the four. The parent tree measures about fourteen feet around the body, and bears crops of good-sized nuts. It stands about ten miles from the site of the Mantura tree.

The Mantura tree is a large, symmetrical specimen with wide-spreading branches. It is about eighty feet high and measures about eleven feet around the trunk. It has been bearing for the last fifteen years, and in 1905 yielded 275 pounds of nuts.

This variety will doubtless prove a valuable acquisition for planters on the northern limits of the pecan area, as the particular

strain from which it comes has been growing in Virginia for more than sixty years.

MEXICAN PAPER-SHELL. (See Biloxi.) Reported by Ladd Bros., Stonewall, Miss. (Listed in "Nut Culture in the United States," p. 64, 1906.)

MEYERS. The fruit of a variety of this name was distributed by Judge Samuel Miller, Bluffton, Mo. (Andrew Fuller, in "The Nut Culturist," p. 170, 1896.)

MOBILE. Large, $2\frac{1}{8} \times \frac{7}{8}$ inches, long, slender, slightly constricted, near the middle, pointed sharply at both base and apex, the latter rather long; color bright light brown, with dark purplish black markings; shell thin, easily cracked; partitions thin; kernel slender, under some conditions not well filled, sutures deep; color light uniform yellow; texture fine-grained, crisp, flavor sweet and nutty, quality good.

Specimens from Frank H. Lewis, Scranton, Miss.

The Mobile pecan is said to have originated as a seedling at Bayou Labatre, Ala., about 1887, and was first propagated about 1900 by F. H. Lewis, and I. P. Delmas, Scranton, Miss. The original tree is said to have borne 400 pounds in a season.

MONARCH. (Syn.: DeWitt Mammoth.) Large, $2 \times \frac{7}{8}$ inches; ovate, sloping to base and apex; color dull gray strongly marked with purplish black splashes; base pointed; apex pointed, wedged; shell medium thick, 1.1 mm.; partitions thick, corky; cracking quality poor; kernel frequently badly filled at base, sutures of medium width and depth, color yellowish brown; texture firm; flavor good, rather dry; quality good.

Originated by G. M. Bacon, DeWitt, Ga. (of the G. M. Bacon Pecan Company), and introduced about the year 1900. Owing to the preëmption of the name Mammoth, by another variety introduced by the late Richard Frotscher, of New Orleans, La., the name DeWitt Mammoth was changed to Monarch.*

MONEY. (Syn.: Senator Money.) Size large, $1 \times \frac{7}{8} \times \frac{7}{8}$ inches; ovate, somewhat four-angled; color light brown marked with blotches of purplish brown sometimes throughout; base abruptly blunt-pointed; apex wedged, pointed; shell brittle, medium to thick, 1.3 mm.; partitions medium; kernel plump, full, bright light yellow; sutures broad, shallow, secondary ones indistinct; texture rather open, of medium grain; flavor sweet, good; quality very good.

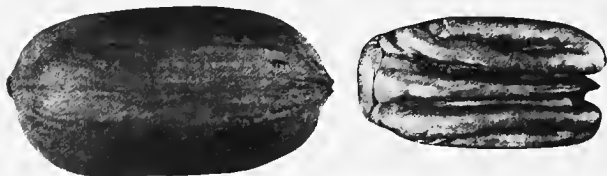
A large, plump-meated pecan of very good quality, described from specimens received from Frank H. Lewis, Scranton, Miss.

*"The Nut Grower," p. 119, March, 1904.

MONEYMAKER. Size medium, $1\frac{5}{8} \times 1$ inches; ovate, oblong; color light yellowish brown with a few purplish brown marks about the apex; base rounded; apex abruptly rounded, slightly wedged; small nipples; shell of medium thickness, 1.1 mm.; partitions medium thick, corky; cracking quality very good; kernel full, plump and broadly oval; sutures straight, broad, shallow, secondary ones small; texture firm, solid; flavor sweet, good quality very good.

Described from specimens received from Prof. F. H. Burnette, Baton Rouge, La. This pecan was originated and introduced by S. H. James, Mound, La.; the quality is very good and the variety is precocious, prolific and hardy.

MOORE. Size small, $1\frac{3}{8} \times \frac{3}{4}$ inches; ovate; color light yellowish brown marked with a few small purplish spots about the apex; base rounded; apex abruptly nipped, short; shell brittle, thin, 1.1 mm.; partitions rather thin; cracking quality very good;



Pabst pecan.

kernel dark yellow, plump, full; sutures narrow, shallow; texture firm, compact, solid; flavor sweet and good; quality very good.

Described from specimens received from J. H. Girardeau, Monticello, Fla. This variety is attracting considerable attention for the general market trade. Extremely prolific.

MORRIS. Size medium, $1\frac{5}{8} \times \frac{3}{4}$ inches; ovate; color light brown, bright, clean; base sloping, rounded; apex tapering abruptly to a blunt point; shell brittle, of medium thickness, 1.45 mm.; partitions thick; cracking quality very good; kernel plump, filling the shell, straw-colored; primary sutures broad and deep, secondary ones shallow; texture firm, compact; flavor sweet, good; quality very good.

Described from specimens received from Summit Nurseries, Monticello, Fla.

NELSON. Nut the largest of all known; some specimens weighing nearly one ounce; elliptical-oblong in shape; medium-thin shell, clean, bright in color; kernel plump, sweet and rich;

quality the very best, a quick grower; early bearer, very prolific; habit of growth like the Frotscher, forming a round-headed tree. (Catalogue J. Steckler Seed Co., 1905, p. 172.)

NIGGER. Medium, short oval, thin shell, full, excellent. (T. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)

PABST. Size large, $1\frac{1}{2} \times \frac{7}{8}$ inches; oblong cylindrical; color dull gray marked with broad splashes of purplish black; base rounded; apex blunt, four-angled, grooved; shell of medium thickness, 1.22 mm.; partitions rather thick; cracking quality fair; kernel plump, large, thick with broad, shallow sutures, secondary sutures short, shallow, bright yellow in color; texture fine; flavor good; quality very good.

Described from specimens received from Wm. A. Taylor, United States Department of Agriculture. The original tree, according to Mr. Taylor, is one of a number of seedlings on the grounds of the late William B. Schmidt at Ocean Springs, Miss. The original tree is now about thirty years old. Quite productive and recommended for planting by those who know it.

PAN-AMERICAN. Large, oblong, thick shell, full, best. (T. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)

PEARL. (E. E. Risien, San Saba, Tex.) Medium size, thin shell, sweet kernel; no corky growth inside. A choice nut for family use, but said to be too small for market. (Thomas' American Fruit Culturist, 21st Ed., 1903.)

PEARL. This is a very productive pecan, originated by Mr. James. It is distinct from the Pearl, which originated in Texas. (Burnette, Bulletin Louisiana Experiment Station, Sec. Ser., No. 69, 1902, p. 874.)

PEGRAM. Size medium, $1\frac{1}{2} \times \frac{7}{8}$ inches; oblong; color light grayish brown marked with a few purplish brown markings at the apex; base rounded; apex blunt, quadrangular; shell creased, roughened, brittle, of medium thickness, 1.15 mm.; partitions medium thick, corky; cracking quality medium; kernel plump, full, quite smooth, sutures narrow and of medium depth; texture firm, compact, solid; flavor sweet and good; quality good.

Described from specimens received from Prof. F. H. Burnette, Baton Rouge, La. Originated by S. H. James, Mound, La.

PERFECTION. (Syn.: James' Perfection.) Size medium, $1\frac{1}{2} \times \frac{7}{8}$ inches; oblong; color grayish-brown marked well down the sides from the apex with purplish-black splashes; base flattened, rounded; apex abrupt, blunt; shell slightly ridged, of medium thickness, 1.3 mm.; partitions rather thick, corky; cracking quality medium; kernel full, plump, brownish yellow, narrow and

moderately deep, sutures narrow, of moderate depth, secondary ones well defined; texture fairly solid; flavor sweet, good; quality very good.

Originated by S. H. James, Mound, La.

PETITE. Small and plump; white hull; very desirable. (Helen Harcourt, Florida.)

POST. (Syn.. Post's Select in part.) Size medium, $1\frac{3}{4} \times 1$ inches; short, obovate, compressed on the upper half; color light brownish yellow, marked with a few purplish splashes about the apex; base rounded; apex blunt, abruptly shouldered; shell of medium thickness, 1.35 mm.; partitions thick; cracking quality medium; kernel plump, bright straw-colored, deeply grooved and wrinkled, texture firm, solid; flavor sweet, delicate; quality good.

Described from specimens from the original tree, received from Wm. A. Taylor, United States Department of Agriculture. The original seedling tree stands on H. B. Freeman's farm on the Colorado river bottom, San Saba county, Texas. It took its name from Mr. Post, a former owner of the place.*

PRESIDENT.† (President Roosevelt.) Form oblong, compressed, with a rather sharply pointed base, and quadrangular apex with prominent point; color bright yellowish brown, with a few narrow and broken black stripes near apex; size large, 45 to 50 nuts to pound; shell of medium thickness for so large a nut, with thin and soft partitions, cracking easily; kernel long, rather deeply and narrowly grooved, but plump and releasing shell easily; kernel color bright and attractive, texture rather fine-grained for so large a nut; flavor pleasant, free from astringence; quality very good.

The President pecan was grown as a seedling from nuts secured from Bagdad, Fla. The seedling tree was sold and planted by a customer in Jacksonville, Fla. It has borne as much as 120 pounds in a season. Its propagation was undertaken and it was introduced in 1903 as President Roosevelt. This was changed to President in 1904.

PRIMATE. (W. R. Stuart, Ocean Springs, Miss.) Of medium size, slender, rather long; shell thin; quality good; ripens in September, thirty days before the other nuts. (Report Secretary Agriculture, 1893, p. 295: 1894.)

RANDALL. (Syn.: Curtis No. 3) Small, $1\frac{3}{8} \times 1$ inches; ovate-oblong; color grayish brown splashed with broad marks of purplish brown, and covered with small dots throughout; base

*Taylor, William A., Yearbook, United States Department Agriculture, 1904.

†Taylor. Yearbook, 1907.

rounded; apex abruptly blunt-pointed; shell rough, of medium thickness; cracking quality very good; partitions corky, of medium thickness, 1.25 mm.; kernel medium size, smooth, roundish sutures, reddish yellow in color; texture firm and compact; flavor sweet and good; quality very good.

Specimens for description obtained of Dr. J. B. Curtis, Orange Heights, Fla. Origin similar to Curtis.

REPTON. Large, shell rather whitish; one end round, the other decidedly pointed; black points; meat sweet and tender; tree remarkably beautiful. From one Repton tree, said to be forty years old, over five hundred pounds of nuts were gathered the season of 1904. (Helen Harcourt, "Florida Fruits and How to Grow Them," 1886, p. 212.)

RIBERA. Size above medium; oblong-ovate; cracking quality good; shell thin; kernel plump, light brown, free from the bitter red, corky growth which adheres to the shell; meat yellow; tender, with rich, delicate, pleasant flavor. (Report Secretary Agriculture, 1893, p. 295, 1894.)

RISIEN. Large ovate; quality excellent. E. E. Risien, San Saba, Texas. (Thomas' "American Fruit Culturist," 21st ed., 1903, p. 453.)

ROBSON. A medium-sized, very thin-shelled nut; oblong-ovoid in shape. A comparatively new variety, but of considerable merit. (Bacon's Catalogue, 1904, p. 28.)

ROME. (Syn.: Columbia, Century, Columbian, Mammoth, Pride of the Coast, Southern Giant, Twentieth Century.) Size large to very large, $1\frac{7}{8} \times 1$ to 2×1 inches; oblong-cylindrical or cylindrical-ovate; color grayish, dirty, much splashed and spotted with dirty, black marks sometimes throughout; base rounded; apex abruptly-pointed, flattened on two sides; shell hard, brittle, thick, 1.6 mm.; cracking quality poor; partitions thick, corky; kernel frequently shrunken, bright yellowish in color, sutures of medium depth, secondary ones well marked, fuzzy material often adhering to lower end; texture coarse, rather dry; flavor dry, lacking in character; quality fair.

Described from specimens received from J. Steckler Seed Co., New Orleans, La. This much-named variety, according to Taylor, was originated by the late Sebastian Rome, at Convent, St. James Parish, La., about 1840. Catalogued by the late Richard Frotscher, under the name "Rome," in 1885. It cannot be recommended for planting.

RUSSELL. Size medium to large, $1\frac{5}{8} \times \frac{7}{8}$ inches; form ovate, slightly compressed; color grayish brown with small specks and

splashes of purplish black; base rounded, blunt-pointed; apex abruptly sloping; shell very thin, brittle, .74 mm.; partitions very thin; cracking quality excellent; kernel usually plump though sometimes shrunken at the base; sutures broad and shallow; texture fairly compact; flavor dry, sweet; quality good.

Described from specimens received from Chas. E. Pabst, Ocean Springs, Miss. The original tree stands in the yard of Mrs. H. F. Russell, at Ocean Springs, and is one of a lot of seedlings raised by the late Col. W. R. Stuart, about 1875. The tree was planted where it now stands by Peter Madsen. It was named by Mr. Pabst, and propagated by him in 1894.

RUSSELL No. 1. Large, long-ovoid, shell thin, plump, good. (T. V. Munson, "Farm and Ranch," Dec. 3, 1904, p. 2.)

RUSSELL No. 2. Very large, ovoid, shell rather thick, very good. (T. V. Munson, "Farm and Ranch, Dec. 3, 1904, p. 2.)

SAN SABA. Size small, $1\frac{3}{8} \times \frac{7}{8}$ inches; ovate, slightly compressed toward the apex; color bright reddish yellow, marked with purplish brown splashes extending from about the middle of the apex; shell very thin and brittle; partitions thin; cracking quality excellent; kernel very plump, smooth, deeply and broadly grooved, bright straw-colored, oval in outline; texture solid, fine-grained; flavor rich, sweet, delicate; quality excellent.

The San Saba may be regarded as a standard of quality among pecans, as the Seckel is among pears. Described from specimens received from E. E. Risien, San Saba, Texas. The variety was introduced by Mr. Risien about 1893. The original tree stands on the San Saba river near its intersection with the Colorado river in Texas.

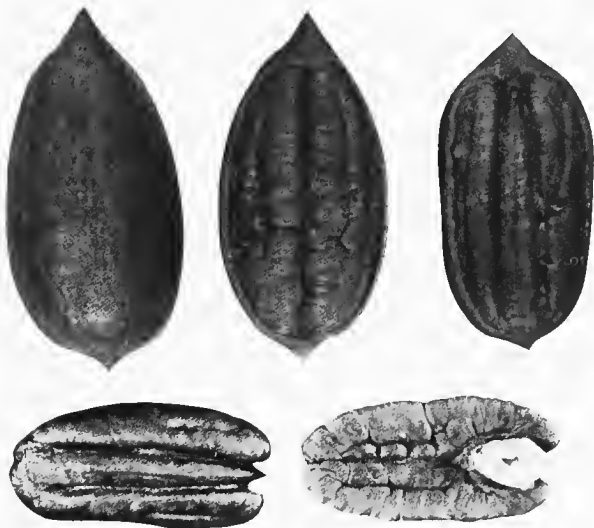
SCHAIFER. (Syn.: Kate Schaifer.) Size medium, $1\frac{3}{4} \times \frac{3}{4}$ inches; cylindrical, slender; color light yellowish brown, marked with a few narrow, purplish splashes at the apex; base sloping, pointed; apex sloping, sharp-pointed; shell rather thick, 1.35 mm.; partitions thick, corky; cracking quality quite good; kernel bright yellowish, plump, filling the shell; smooth; sutures shallow of medium width; texture fine-grained; flavor sweet, good; quality very good.

Described from specimens received from Prof. F. H. Burnette, Baton Rouge, La. Originated by S. H. James, Mound, La. Said to be prolific.

SCHLEY. Size large, $1\frac{7}{8} \times \frac{7}{8} \times \frac{3}{8}$ inches; oblong, oval, flattened; color light reddish brown, marked with small specks about the base and small splashes of purplish brown about the apex; base rounded, abruptly short nipped; apex abrupt, flattened on two sides and rather sharp-pointed; shell brittle, dense, thin, .75 mm.;

cracking quality excellent, shell breaking easily and readily separating from the kernel; kernel very full and plump; smooth, with shallow sutures and almost entirely free from wrinkles; bright light yellowish brown in color; texture very firm; flavor rich sweet, nutty; quality best; season early.

Obtained from Summit Nurseries, Monticello, Fla. Not so prolific as some varieties, but, in point of quality, unsurpassed.



The Schley pecan.

SENATOR. Medium; ovate; shell and partitions thin; kernel full and plump; quality excellent. G. M. Bacon, DeWitt, Ga. (Hume, Bulletin No. 54, Florida Experiment Station, p. 204, 1900.)

SOVEREIGN.* (Texas Prolific.) Size large, averaging 50 to 55 nuts per pound; form oblong to oblong-obovate, compressed, with a full and smooth base and a blunt and usually symmetrical apex; surface quite lumpy, conforming to the undulations of the kernel; color bright, yellowish, with long, narrow, striped markings, ranging from bright red to reddish brown in color;

* Taylor. Yearbook, 1907.

shell thin to medium for so large a nut; not a distinct paper shell, like San Saba, Russell, Young, and a few others, but brittle and cracking easily; kernel plump, rather narrowly and deeply grooved, and considerably convoluted, not releasing the shell as easily as some; kernel color bright and clear; texture very fine-grained and firm; flavor sweet, rich, nutty, quality very good.

This variety originated at Rescue, Texas, and was introduced by Mr. E. E. Risien. It is worthy of trial in the western semi-arid pecan districts.

STEVENS. Named for Hon. O. B. Stevens, Commissioner of Agriculture. Not very large, but bright, pretty and neatly shaped. Very thin shell and always full of nice, rich meat,



Stuart pecan.

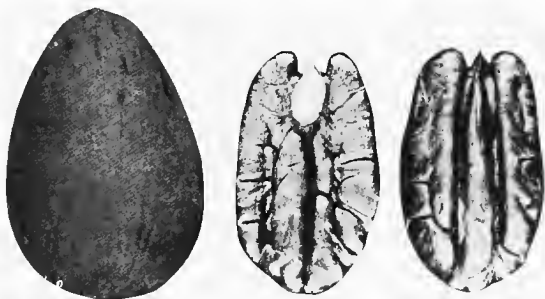
whether the seasons are wet or dry. Trees medium bloomers, and full bearers of nuts uniform in shape and size. (Bacon's Catalogue, 1900.)

STUART. (Syn.: *Castanera*.) Size large to very large, $1\frac{1}{2} \times 1$ inches; ovate cylindrical; color grayish brown splashed and dotted with purplish black; base rounded, tipped; apex blunt, abrupt, somewhat four-angled; shell medium in thickness, 1.1 mm.; partitions thin; cracking quality very good; kernel plump full, bright straw-colored; sutures moderately broad and deep, secondary sutures not well defined; texture solid, fine-grained; flavor rich, sweet; quality very good.

Described from specimens received from the Stuart Pecan Company, Ocean Springs, Miss. This variety has been tested and

found to succeed over a wide range of country. The original tree,* grown from a nut planted by John R. Lassabe, about 1874, stood in the garden now owned by Capt. E. Castanera, Pascagoula, Miss. It was blown down in October, 1893, but a new shoot, now in bearing, has sprung up from the roots.

SUCCESS. Size large, $1\frac{3}{8} \times 1$ inches; oblong-ovate, tapering from near base to apex; color light yellowish brown strongly marked with purplish brown splashes about the apex; base flattened, roundish; apex blunt, four-angled; shell thin, .93 mm.; cracking quality very good; partitions thin; kernel large, full, plump, filling the shell, light yellow in color; sutures broad, of



Success pecan.

medium depth, inner surface wrinkled, oval in outline; texture firm, solid, compact; flavor sweet, rich; quality very good.

The original tree was found "growing in a crowded row of seedlings planted at Ocean Springs, Miss., by the late W. B. Schmidt, about ten years previously. The original Success tree first attracted attention in the fall of 1901." Described from specimens received from Theo. Bechtel, Ocean Springs, Miss.

SWEETMEAT. Size medium, $1\frac{1}{4} \times \frac{7}{8}$ inches; color bright grayish brown marked with small streaks of purplish brown about the apex; abruptly blunt; shell thin, .8 mm.; partitions of medium thickness, corky; cracking quality good; kernel plump, full, light yellow; sutures broad, shallow; texture fine-grained, compact; flavor sweet; quality good.

Described from specimens received from Summit Nurseries, Monticello, Fla.

* Taylor. Yearbook, 1904.

TAYLOR.* Form long, rather slender, constricted near middle; slightly curved, with pointed base and long sharp apex; color bright yellowish brown, with few and narrow black markings irregularly placed; size rather large, 60 to 65 nuts per pound; shell thin, with thin and soft partitions, cracking very easily; kernel long, slender, rather deeply grooved, but plump, smooth and releasing the shell easily; color bright yellowish, texture very fine-grained and crisp; flavor sweet, nutty, free from astringence; quality very good.

The Taylor pecan was grown from a nut planted by the brother of the present owner of the tree, Miss Lulu Taylor, Handsboro, Miss., about 1885. It was first propagated by Mr. W. F. Heikes, Huntsville, Ala., at Biloxi, Miss., about 1901. It is well regarded as a desirable variety and is worthy of being tested over the lower pecan area.

TECHE. Medium to large, $1\frac{1}{8} \times \frac{3}{4}$ inches, oblong, tapering, rounded at base, blunt pointed, and sharp tipped, rather four angled at apex; grayish brown, striped with black toward apex; shell thin, easily cracked; kernel plump, well filled; firm, rich; quality very good; very heavy and regular bearer. A good orchard variety. Originated in Louisiana; confused with Frotscher but very distinct.

TEXAS. Quite large, some very long; white hull; black points. (Helen Harcourt, "Florida Fruits and How to Grow Them," 1886, p. 212.)

THOMAS. Size small, $1\frac{1}{8} \times 1$ inches; short, roundish oblong; color brownish gray dotted with small specks throughout, marked with dark purplish splashes from middle to apex; base rounded; apex abruptly short, pointed, nipped; shell of medium thickness, 1.2 mm.; partitions thick, corky, reddish; cracking quality quite good; kernel plump, filling the shell, sutures of medium depth, narrow, texture compact, fine-grained, solid; flavor good; quality good.

Described from specimens received from Walter Thomas, Palatka, Fla.

TURKEY EGG, JR. Smaller and shorter than the above; cracking quality medium; shell of medium thickness; kernel plump, light colored; tender, oily, rich; good. (Report Secretary Agriculture, 1893, p. 296, 1894.)

TURKEY EGG, SR. Large, long, pointed; cracking quality very good; shell of medium thickness; kernel long, plump; brownish yellow; separates readily from the shell; meat yellow, a little tough; not of highest quality. (Report Secretary Agriculture, 1893, p. 296, 1894.)

*Taylor. Yearbook, 1908.

TURNER. Medium; elliptical oblong; shell thin; partitions slightly corky; kernel plump, sweet; quality excellent. G. L. Taber, Glen St. Mary, Fla. (Hume, Bulletin No. 54, Florida Experiment Station, p. 203, 1900.)

VAN DEMAN. (Syn.: Bourgeois, Duminie Mire, Southern Beauty, Paragon in part.) Large to very large, $2\frac{1}{2} \times 1 \times \frac{7}{8}$ inches; oblong cylindrical; color reddish brown with splashes and streaks of purplish brown; base sloping, blunt-pointed; apex tapering, sharp-pointed; shell of medium thickness; cracking quality fine; partitions thick; kernel light brownish yellow, sutures rather deeply and narrowly grooved with secondary sutures forming a mere line; kernel fine-grained and compact, sometimes slack at the end; flavor sweet and delicate; quality very good.



Van Deman pecan.

Specimens for description obtained of Dr. J. B. Curtis, Orange Heights, Fla. The original tree of this variety was grown from a nut planted by the late Duminie Mire of Union, St. James Parish, La., in 1836. The tree still stands, thrifty and vigorous, bearing 200 to 300 pounds of nuts yearly. It was first widely distributed by the late Col. W. R. Stuart, Ocean Springs, Miss., who gave it the name Van Deman. Previously it had been propagated and distributed locally by the late Emù Bourgeois.*

VALSIES. Reported by Ladd Bros., Stonewall, Miss., and listed in "Nut Culture in the United States," United States Department of Agriculture, Division Pomology, 1896, p. 64.

*Taylor. Yearbook, 1904.

WILLIAMS. Medium to large size, $1\frac{3}{4} \times \frac{7}{8}$, $1\frac{1}{2} \times \frac{7}{8}$ inches; oval in outline, marked longitudinally with either four or six well-defined ridges; rounded or bluntly tapered at the base, tapering abruptly to the blunt or medium blunt and somewhat quadrangular apex; color grayish brown with few small black markings about the apex; shell medium thick, cracking easily and separating readily from the kernel; partitions medium thick, kernel light brown, oval, smooth; sutures broad, shallow, secondary ones lacking; texture fine-grained; flavor sweet, nutty; quality very good.

This variety was introduced by Mr. A. K. Clingman, Keithville, La., who named it for Capt. W. H. Williams, Shreveport, La. In December, 1897 or January, 1898, Capt. Williams planted five nuts grown at Bay St. Louis, Miss. In the fifth year one of them (the Williams) bore, and has done so regularly ever since, in 1909, producing twenty-seven pounds of nuts. The other four trees were worthless. The parent tree at Shreveport, La., is about thirty feet high, symmetrical and thrifty.

WILLINGHAM. Illustrated in "Farm and Ranch," Vol. 23, No. 49, Dec. 3, 1904, p. 1.

WOLFORD. *Size medium or slightly below, averaging 75 to 90 nuts per pound; form oval to oblong-oval, compressed, with a rather blunt, slightly curved, quadrangular apex; color rather bright yellowish brown, with few narrow velvety black markings; shell very thin and quite brittle, with thin and soft partitions, cracking easily; kernel plump, smooth and full to the tip, with rather narrow but shallow grooves, releasing the shell easily; kernel color bright golden brown; texture fine, meaty and solid; flavor rich, nutty and free from astringence; quality very good.

This variety was found as a seedling in Wilson Creek bottom, near McKinney, Tex., by Mr. E. W. Kirkpatrick, about 1898, and its propagation was undertaken by Mr. Kirkpatrick. It was named for the owner of the tree.

YOUNG. Medium to large, $1\frac{5}{8} \times 1$ inches; ovate cylindrical, rounded at the base; color grayish brown, splashed with purplish brown markings from center to apex; base rounded; apex sloping rather abruptly, nipped; shell brittle, thin, .76 mm.; cracking quality very good; partitions thin; kernel full, plump, slightly wrinkled with broad and shallow sutures; texture fairly solid, flavor sweet, rich, nutty; quality very good.

Obtained from Chas. E. Pabst, Ocean Springs, Miss. Originated by and named for B. M. Young, Morgan City, Louisiana.

*Taylor. Yearbook, 1907.

HYBRID PECANS

The pecan appears to inter-pollinate freely with some of the other species of hickory, particularly *H. minima*, *H. laciniosa* and *H. alba*. A number of what are believed to be well-marked hybrids of the pecan with these different species have been found, the most noteworthy of which, perhaps, are given below:

MCCALLISTER. (Syn.: Floyd.) Received from O. L. McCallister, Mount Vernon, Ind. This is probably a hybrid. It is the largest nut among all the hickories received at this office. The hull is about one-fourth of an inch thick when dry, and opens readily to the base with four valves. Nut $2\frac{1}{8}$ inches long, $1\frac{5}{8}$ inches wide, and $1\frac{1}{8}$ inches thick; base broad, rounded; apex broad, blunt, angular. In compressed form, in color of nut, also in the angularity and thickness of shell, it is quite similar to shellbark hickory. The kernel of a well-filled specimen is in color, consistency and flavor more like a shellbark of high quality than a pecan. The tree is reported to be "so similar to pecan in bark and leaf that it would be impossible to detect the difference," yet the buds and young wood more closely resemble shellbark. The tree was found many years ago on a farm now owned by Mr. McCallister. The nuts have little pomological value, as grown on the original tree some years, the kernel being shriveled and not filling more than one-third of the space within the shell; yet nuts from the crop of 1893 have been received at the Division of Pomology which were well filled with a kernel of very pleasant flavor. Possibly it may become more uniform in maturing fruit in Mississippi or Texas, where the season is longer than in Indiana. It is well worth a trial by experimenters in those states. Sargent gives a short description of this nut under the name Floyd, and accredits the points of his description to A. S. Fuller, in New York Tribune, weekly edition, July 9, 1892, and says it is perhaps a hybrid. ("Nut Culture in the United States," 1896, p. 63-4.)

NUSSBAUMER. In the American Agriculturist for 1884, p. 546, f. l., A. S. Fuller published an account of a supposed hybrid between this species and the pecan, which has been called the Nussbaumer hybrid, after J. J. Nussbaumer, of Okawville, Ill., who first brought it to the attention of Judge Samuel Miller, of Bluffton, Mo. Mr. Nussbaumer writes me that the original tree which stands in the bottom between Mascoutah and Fayetteville, Ill., in general appearance resembles *laciniosa*, though

the bark is intermediate between that of the Pecan and Mockernut. Professor Sargent states (Silva, vii, 158) that a small tree grown from this in New Jersey, by Mr. Fuller, cannot be distinguished from *laciniosa* of the same age; and I should hardly be able to distinguish an imperfect twig from a small tree, cultivated by Judge Miller, from *laciniosa*. The nut, however, is very peculiar, being more elongated than is usual in that species, and widened upwardly, less acutely angled, "as if the ridges had been sandpapered down," and so thin-shelled that it can be crushed easily by pressing two together in the palm of the hand. A somewhat similar nut, originally from Indiana, was described by Mr.



Photograph by Dr. Trelease
The Nussbaumer hybrid.

Fuller, in the "New York Weekly Tribune," July 9, 1892 (Sargent's Silva, l. c.), as cultivated by R. M. Floyd, of Cedar Rapids, Iowa. And in the autumn of 1895, Dr. J. Schneck sent me ample fruit, twig and leaf specimens of a similar hickory from Posey county, Indiana. The nut of this last is almost identical with a specimen of the Nussbaumer nut in the Englemann herbarium, while its twigs closely resemble those of *laciniosa*, and the leaves are decidedly of the pecan type. I am led to the conclusion, therefore, that these several forms really represent hybrids between *H. pecan* and *H. laciniosa*. In size, quality, and thinness of shell, they appear to be the most valuable of American nuts. (William Trelease, Seventh Report Missouri Botanical Garden, 1896, pp. 40-41.)

POOSHÉE. Size small, $1\frac{1}{8} \times \frac{7}{8} \times \frac{3}{4}$ inches; ovate, flattened, wedged, sutures prominent; color dull brown with a very few dark lines at the apex; base rounded; apex flattened abruptly short-pointed; shell medium in thickness, 1.5 mm.; partitions thin, four-celled at base; kernel rounded in outline, light yellow in color; sutures broad, shallow, halves indented at base; surface much wrinkled and corrugated; flavor sweetish,



The Schneck hybrid,

Photograph by Dr. Trelease

Specimens of this nut were secured from Dr. J. F. Wilson, Poulan, Ga., who received them from Professor Burgess, Clemson College, S. C. The nut presents exactly the same characteristics as the Westbrook, except in flavor and color of kernel. It, too, is doubtless a hybrid, *H. minima* \times *H. pecan*. The original tree of this variety stands by or in the old Ravenel cemetery, near Pinopolis, Berkely county, S. C.

SCHNECK. In the autumn of 1894, Dr. J. Schneck, of Mt. Carmel, Ill., and F. Reppert, of Muscatine, Iowa, sent to the herbarium twigs and fruit of bottom-land trees that appear to be hybrids of this species with the pecan. The bark of the Iowa tree is described as being much like that of the Mockernut, while the tree of Dr. Schneck is smooth-barked, resembling the pecan. So far as I have seen them, the twigs of both might pass for those of *alba*, except that the outer scales of the terminal buds are persistent, while the foliage, though intermediate, is strongly suggestive of that of the pecan. The fruit is oblong, almost two inches long, the husk 6 mm., thick, parted nearly to the base, with strongly elevated margins to the segments, and rather persistent on the tree. The nuts are nearly as pale as in the Shagbark, conspicuously brown-striped, slightly four-celled at the very base, and with a wall only 1 mm. thick. As is usual in *Alba*,



H. minima and hybrids, Westbrook and Pooshee.

they are upwardly attenuate, and frequently the kernel is abortive. (William Trelease, Seventh Report Missouri Botanical Garden, 1896, pp. 44-45.)

WESTBROOK. Size small, $1\frac{3}{4} \times \frac{7}{8}$ inches; ovate, flattened, prominently sutured; color brown with a few indistinct brownish streaks close to the apex; base rounded; apex wedge-shaped, ridge, abruptly-pointed; shell rough and irregular, thin, 8.5 mm.;

partitions rather thin, four-celled at base; kernel reddish brown, much wrinkled, sutures of moderate width and depth, halves divided at the base, much corrugated in cross section; flavor decidedly bitter and puckery.

The parent tree is one standing in the yard of J. S. Westbrook, Mt. Olive, N. C., and grew from what, to all appearances, was a pecan nut. The foliage and general aspect of the tree closely resemble the pecan, though the serrations on the leaves are coarser and larger. The fruit resembles, in many respects, that of *Hicoria minima*, and, in short, it appears to be a well-marked hybrid between that species and *H. pecan*.



Stuart pecan tree.

CHAPTER XVIII

PECAN LITERATURE

WHEN the first edition of "The Pecan and Its Culture" was issued, in 1906, the literature on the subject was rather scant. The brief list published at that time has been considerably increased, and important bulletins have been published by the Experiment Stations and Departments of Agriculture of a number of states. The list, brought up to date, is as follows:

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